Boiler Performance When Operating at Overrating—
Minimum-Cost Method of Transformer Design—and Other Articles

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Unnecessary Waste of Energy

THERE is a loud demand for more power than many central stations can furnish. Geared for war, the nation will forge ahead at ever-accelerating speed. It will require power, more power, still more power for the essential industries which are a part of the highly developed war machine. If more power cannot be provided by the electric utilities, only one alternative will be open and no one will hesitate about resorting to it. The alternative is to give less power to industries and other consumers unconnected with the war. Surplus power gained in this way will be diverted to lessen the deficit in war industries. The paramount thing is to win the war.

The ELECTRICAL WORLD believes that, barring unexpected change in the war situation, the distribution of energy will have to be determined by a system of virtual priority. Whether this will be done by active cooperation in which the authorities make the controlling decisions or whether the central station company itself shall rule on these points, the method adopted is less important than the recognition of the principle that we are at war and that the national interest is the only matter than really counts. It may be against franchise stipulations, it may be rankest discrimination under public utility laws, but these obstacles will become as dust if the national need is acute. What we are concerned with is to look ahead so as to meet the exigency, when and if it comes, as readily and effectively as any purely internal operating problem. If action by municipal or state authorities is required in order to make the steps legal, it is dollars to doughnuts that this action will be forthcoming; opposition would lead merely to seizure of the plant by the military authorities, as illustrated recently in a cantonment case.

Taking for granted, therefore, that the essential industries will by some means have all the power they require, the detail ways by which sufficient surplus will be created will have careful attention. The shameless situation in coal supply will certainly be cleared for war companies. Then it will be up to the companies to please their restricted customers and undoubtedly they will find many disgruntled kickers. They may even find the man who is for the war and enthusiastically for all of its benefits but who wants none of its hardships to boot.

In view of the present outlook for restriction of power to unessential consumers and of the uncertainties in the war outlook the companies face the possibility of further changes in commercial practice. Many have anticipated these to some extent by curtailing sales departments. Others talk of discouraging the use of energy in signs that they regard as involving unnecessary consumption of power. It is not that signs involve much energy or coal, for they do not; the truth as to the relatively small amounts they take dispels most criticism. But if every ounce of coal is needed to win the war, the ounces that are consumed in unnecessary white ways, in heedless private and public lighting, could be saved. The strongest argument against lighting that is not absolutely vital to comfort and safety, however, is the moral or psychological one; people imagine that the waste is a thousand times more than it is. If we are called on to cut to the bone, let us do it willingly and show the public that we are ready to do our part.

You Can Do Your Bit—Buy a Bond

The Rating of Lighting Systems

IT IS a fact only too familiar that artificial lighting systems are generally not in good condition. In industrial plants particularly, where there is seldom available expert attention to the lighting as such, the various units used are very commonly found to be in bad shape. Lamps blackened, burned out or dirty, shades grimy with the accumulations of weeks, ill-fitting and battered, bear witness to the neglect that is all too common. We have over and over again published data regarding these evils from a practical standpoint, and therefore welcome the brief paper by Davis H. Tuck on a somewhat conventional way of judging the present state of any lighting equipment. The scheme is a comparatively simple one, consisting of grading the efficiency of maintenance with respect to the various untoward happenings which put the lighting equipment in bad shape. The condition of lamps and shades, of circuits and accessories, is rated on a basis of 100 per cent efficiency of maintenance for equipment in thoroughly good condition. Then, even in a somewhat cursory inspection, a fair estimate can be made of the importance of the destructive factors in the case of any lamp or group of lamps. For instance, a dirty lamp is counted at 80 per cent and a dirty reflector also at 80 per cent. If the lamp is both dirty and has a dirty reflector, the efficiency is reckoned at 64 per cent, and so on, and if a hundred lamps are in this unfortunate condition, that hundred has to be scored at this relatively low percentage of merit.

Going through a whole lighting equipment in a similar manner and attributing to each lamp its observable defects, an average efficiency of maintenance for the whole group can be quickly computed. In one typical example figured by Mr. Tuck a particular equipment

thus rated footed up to 55.2 per cent, and by correcting the faults of maintenance the average illumination as measured by an illuminometer was doubled. This shows the practical value of what seems at the first glance a somewhat empirical method of procedure, which has the advantages, however, of being quick and effective. A rating scheme of this kind is altogether commendable as giving a concrete idea of general conditions. As might be expected, Mr. Tuck finds these much worse on the average with local lighting than with the general illumination in which larger units are used. It is a common experience that even with well-planned and liberal general lighting a considerable factor of safety has to be allowed for the equipment being out of condition. With local lighting, especially in an industrial establishment, the average conditions are likely to be much worse, owing, first, to the greater exposure of the lighting units and, second, to the fact that faults in a large unit obtrude themselves on the attention, while those in the numerous smaller units may escape notice. The practical value of this sort of well-ordered inspection ought to be very obvious. If the proprietor of an industrial establishment found that some one had passed off on him incandescent lamps of only half the efficiency of the standard, a howl would go up that would din into the ears of the state commission. Let him be as careful of his own private affairs as he justifiably expects the public service company to be, and there will be far fewer complaints of improper lighting.

It Is Good Patriotism—Buy a Bond

The Fine Art of Firing

THE paper by Victor B. Phillips on boiler control deals with a vital point in steam-producing economy. A furnace or a boiler, like every other apparatus, has a point of maximum efficiency, and in combining furnace and boiler it is imperative to know just what union of these two factors gives the highest final efficiency of steam production. An overloaded or an underloaded boiler or furnace performs somewhat badly, and since both overloading and underloading are necessary conditions in the operation of the average plant, a close knowledge of the variation of the efficiency with the load has a direct bearing on costs of operation. Difference in handling may very well make a change of 25 per cent in the furnace efficiency. To meet the requirements of pushing boilers to the utmost output it is necessary to have a good deal of flexibility in the operation of the furnace part of the plant, so that the combustion may be accurately regulated. It must work well at all loads, and the wider the range over which it works the better. Mr. Phillips' experiments give a very instructive view of the situation and not only show the conditions of good working but also indicate the limitations impressed on these by the stoking mechanism. It is not by any means true that the mechanical stoker clears up all the difficulties with regard to firing. Generally speaking, it does much its best work at a particular rating and with a particular fuel, and the lesson to be learned in these days is how best to extend the favorable range of operation over a wider area.

A very striking part of Mr. Phillips' article is the showing made of the evil effects of too thick fire. It is, of course, a familiar fact that a thin and even fire gives the highest attainable furnace efficiency, yet the curves shown impress that fact with startling force. To find for the same standard high output a difference of 30 per cent in the fuel consumed as between a thin fire and a thick one ought to make the station operator sit up and take notice of the problems of capacity. Of course, this relation is intimately connected with the possible air supply which can be made available. Only a very free opportunity to vary the air supply to the point of maximum efficiency will give a furnace which operates satisfactorily over a wide range of output. Another factor of great importance practically is the relation of furnace design to the character of the fuel used. More and more importance is being attached to the heating of the boiler surfaces by radiation rather than by convection. The ratio of these two heating factors turns in the main on the character of the fuel. In a rough general way the smaller the volatile contents of the fuel the larger the relative importance of radiation. The furnace design, therefore, has to cover a wide variety of possibilities and really involves many fine points in engineering. The larger the range of output which must be covered and the more varied the fuel which may have to be used the more difficult it is to obtain high heating efficiency. Inasmuch as the efficiency of the turbo-generator is already in a highly satisfactory state, the boiler and furnace together constitute the largest outstanding variable factor in efficiency and consequently deserve the same attention and care that have been bestowed upon engine and dynamo design.

It Is the People's Loan—Help It

Specific Preparation for War Service

EVERY electrical manufacturer and every ranking staff employee of a plant-producing equipment of direct importance from the standpoint of the government's present needs owes it to his country and to the industry to be prepared to state at a moment's notice precisely what he is doing that has a bearing upon the successful conduct of the war. Many thousands of trained electrical men are needed with the colors, and all will honor those who go, no matter whether they go ahead of the formal selection of the country or in response to it. In time of war, however, it becomes necessary to make an almost infinite number of adjustments of personal services, compared with peace conditions. It is a delicate question just where a man belongs. The government at Washington is now in possession of a vast amount of useful information about American technical men, thanks to the census work done by the engineering societies, and yet it behooves every man to study the question of how he can

be of maximum usefulness and then to endeavor so far as is consistent with his sense of patriotic duty to attain unto it. Others may have to decide where he is to go or stay, but in times like these a quiet understanding of one's personal equation in industry is worth gaining. The higher the executive in electrical manufacturing, the more essential it becomes that indiscriminating changes of service be avoided.

Don't Be a Slacker—Buy a Bond

Reorganizing the Electrical Trade

BY THE adoption of a new constitution and the reorganization that it makes possible the National Contractors' Association of the United States, as explained elsewhere, has taken a long step forward. As the creator of business in the industry the contractor and contractor-dealer group is an essential part of its structure and growth. In taking the initiative to stabilize the resale and installation trade the association has set a mark which in many ways establishes it as a leader in the industry.

Systems of distributing commodities in this country are now under the rigid scrutiny of thinking business men. The electrical manufacturer, central station, consulting engineer, industrial jobber and contractor-dealer together make up the distributing chain in the electrical industry. The trade relations between these groups to-day are complicated and in many instances wasteful. We have called attention to this condition in many earlier editorials, pointing out particularly that because the men of the electrical industry have developed design and production on a scientific basis they should be the first to recognize the practicability of analyzing and correcting trade abuses from the same scientific viewpoint.

Various organizations, associations and individuals have helped to remedy conditions. We have passed in common with other industries through the stage of special arrangements and agreements into the stage of organized activity to get at fundamentals and build around those. The most comprehensive plan which has been proposed, and one which its author frankly states is a composite of many men's ideas, is the so-called Goodwin movement. Boiled to its fundamentals, the Goodwin plan comprises first the classification of the industry into buying groups. the organization of those groups where not already organized into purposeful associations, the intelligent classification of the commodities and supplies sold to those groups by the manufacturer, and the pricing and adjusting of trade prices by the individual manufacturer so that the discounts along the chain of distribution will give a margin of profit in each group that will provide an incentive to go after business.

The contractors have recorded themselves in favor of this general plan. As far back as 1902 the National Electrical Contractors' Association had a vision of its function. To-day the opportunity exists to carry out its purpose. Much must be done. The rank and file of contractors must be awakened to their business opportunity. With trade margins adjusted, however, the contractor and the contractor-dealer can make a profit under fair and just competitive conditions and become bigger business men.

Have You Enlisted Your Money?

Formulas for Traction Electromagnets

LIFTING electromagnets for both direct and alternating currents are employed for so many purposes that it is important to standardize their designs in conformity with experience. The fundamental principles of their action are well established, but in the application of those principles to practical design there is much room for empiricism and experimental trial. It is desirable to set reasonable limits to the range of these experimental variations.

Having given a device which has to exert an assigned pull over a given distance or length of stroke, the intensity of the magnetic field required and the area of the magnetic polar surfaces become fairly well defined. The size and cost of the electromagnet are, however, much less easy to establish. They depend upon the amount of electric power which must be dissipated in the winding or windings in order to obtain the correct excitation.

The article by George L. Hedges this week is directed toward the determination of the most satisfactory and most economical designs for an electromagnet of given duty. The formula to be selected depends on whether the service is to be continuous or intermittent; also on whether the work calls for a solenoid or for a plunger electromagnet.

Assuming that the formulas and charts have been satisfactorily checked and tested by practical trials, the data should be of much service to electromagnet designers.

The Coming Issues

ONE of the principal articles which will be printed in the next issue of the ELECTRICAL WORLD will dwell on methods which have been adopted by central station companies to increase the efficiency and economy of their commercial departments as a result of war-time conditions. These methods have been analyzed with the view of bringing out the best practice of companies which have given this subject serious consideration. Another article will emphasize the advantages to be gained by the use of electric furnaces in various metallurgical processes involving non-ferrous metals. Data will be presented on the performance of various furnaces in different commercial installations under different conditions. In addition, information will be presented on subjects of interest to industrial plant and other electrical engineers, and the various departments will appear as usual.

Design of Solenoids and Plunger Magnets

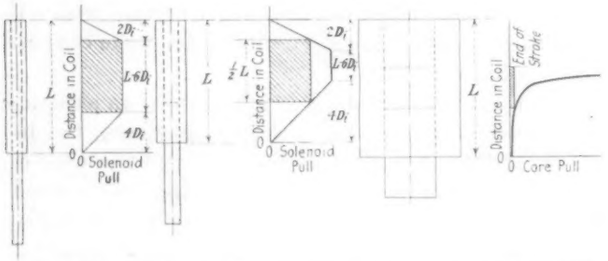
Formulas for Computing Diameters of Plungers for Cheapest, Lightest and Smallest Designs—Charts to Facilitate Calculations Which Refer to Cylindrical Direct-Current Types Only

BY GEORGE L. HEDGES

Engineer Kelman Electric & Manufacturing Company, Los Angeles, Cal.

THE usual method of design of a magnet is to assume a diameter of plunger and calculate the ampere turns necessary to give the required pull, then calculate the winding necessary for the ampere turns. By making a number of calculations starting with different plunger diameters the most efficient magnet is approximated. It is easily realized that this method of design involves considerable laborious calculation and has the objectionable features inherent in cut-and-try calculations. By the use of the formulas deduced in this paper the plunger diameter for the most economical magnet—cheapest, lightest or smallest—may be found directly. The paper will consider only cylindrical magnets for use on direct-current circuits.

To simplify calculation the bobbin thickness, the thickness of the bobbin insulation and the clearance between plunger and bobbin have been neglected; that is, the inside diameter of the winding has been considered the same as the plunger diameter. This approximation will not cause sufficient error to affect the commercial accuracy of the results.



FIGS. 1(*a*), 1(*b*) AND 2—OUTLINES AND APPROXIMATE PULL CURVES OF LONG AND SHORT SOLENOIDS AND PLUNGER ELECTROMAGNETS

Pull and Work of an Electromagnet.—The pull of a solenoid is due entirely to the attraction between the winding and the plunger, the maximum existing at the center of the winding and being equal to

$$F_s = gANI/L = \pi g D_i^2/4 \times NI/L. \qquad (1)$$

Typical solenoids with approximate pull curves are shown in Fig. 1: (a) for a solenoid of length equal to or greater than twelve plunger diameters (L = or > $12D_i$), and (b) for a solenoid of length less than or equal to twelve plunger diameters (L = or < $12D_i$).

The total work exerted by a solenoid is equal to the total area inclosed under the pull curve. The maximum useful work, W_s (uniform pull times stroke), available from a solenoid is equal to the effective pull × stroke. It is evident from the pull curves in Fig. 1 that for maximum useful work, other conditions being equal, the longer of two solenoids is the most economical to use. For a solenoid of given proportions such that $L = qD_i$, the conditions for maximum useful work (Fig. 1) are: (a) for a long solenoid $l = L - 6D_i = (q - 6)D_i$, and pull = F_s, hence $W_s = F_s(q - 6)D_i$; (b) for a short solenoid

$$l = L/2 = qD_i/2, \qquad (2)$$

and pull = $L/12D_i \times F_s = qF_s/12$.
Hence $W_s = q^2F_sD_i \div 24$.

In general, therefore, the condition for maximum useful work with a long or a short solenoid is $W_s = F_s p D_i$, where $p = q - 6 = L/D_i - 6$ for long solenoids, and $p = q^2/24 = L^2/24D_i^2$ for short solenoids. A good average value of q is 12, whence $L = 12D_i$, and both (a) and (b) above give $l = pD_i = 6D_i$; pull = F_s; $W_s = F_s l = 6D_iF_s$, and $p = 6$. Such relations give the shortest solenoid for which the height of the work rectangle (Fig. 1) is equal to the maximum solenoid pull.

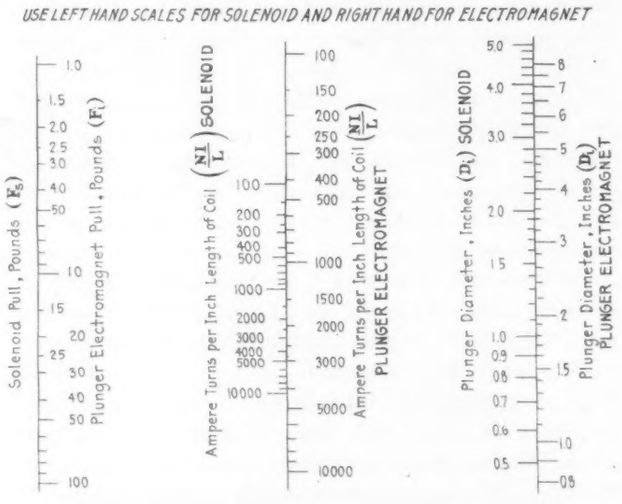

USE LEFT HAND SCALES FOR SOLENOID AND RIGHT HAND FOR ELECTROMAGNET
Solenoid Pull, Pounds (F_s)
Plunger Electromagnet Pull, Pounds (F_l)
Ampere Turns per Inch Length of Coil (NI/L) SOLENOID
Ampere Turns per Inch Length of Coil (NI/L) PLUNGER ELECTROMAGNET
Plunger Diameter, Inches (D_i) SOLENOID
Plunger Diameter, Inches (D_i) PLUNGER ELECTROMAGNET

FIG. 3—AMPERE TURNS REQUIRED PER INCH FOR A GIVEN PULL WITH SOLENOIDS AND PLUNGER ELECTROMAGNETS

Plunger Electromagnet Work, Inch Pounds (W_l)
Solenoid Work, Inch Pounds (W_s)
Ampere Turns per Inch Length of Coil (NI/L) SOLENOID
Ampere Turns per Inch Length of Coil (NI/L) PLUNGER ELECTROMAGNET
Plunger Diameter, Inches (D_i) SOLENOID
Plunger Diameter, Inches (D_i) PLUNGER ELECTROMAGNET

FIG. 4—AMPERE TURNS REQUIRED PER INCH ON SOLENOIDS AND PLUNGER MAGNETS TO SECURE A GIVEN AMOUNT OF WORK

The pull of a plunger electromagnet is made up of

two components—the solenoid pull, or pull between the winding and the plunger, and the core pull, or the attraction between the core and the plunger. The core-pull component is the predominant component for plunger electromagnets with the comparatively short

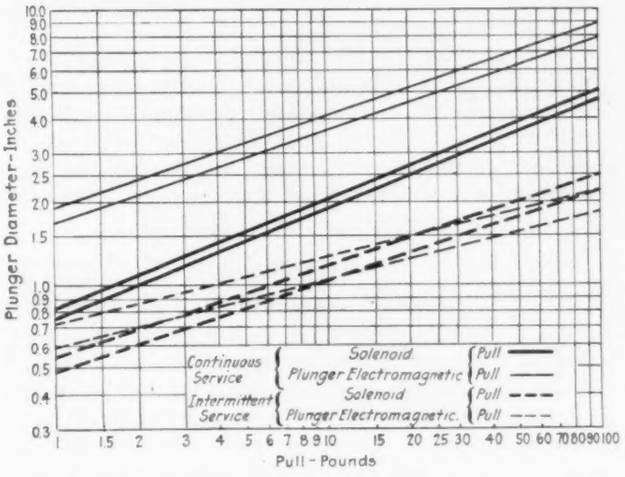


FIG. 5—PLUNGER DIAMETER* OF SMALLEST SOLENOID OR PLUNGER MAGNET FOR A GIVEN PULL

strokes usually used, and in these calculations for plunger electromagnets the core pull will be considered, while the total pull and the solenoid pull will be neglected. The core pull is:

$$F_c = A\left[\frac{NI}{2660hL}\right]^2 = \frac{\pi D_i^2}{4}\left[\frac{NI}{2660hL}\right]^2 \qquad (3)$$

The maximum useful core work for a given stroke (shown in Fig. 2 by the shaded area) is W_c = pull × stroke. For an electromagnet of given proportions such that $L = qD_i$, $l = hL = hqD_i$; hence $W_c = F_c hqD_i = F_c pD_i$, and $F_c = W_c/pD_i$.

Thickness of an Electromagnet Winding.†—The

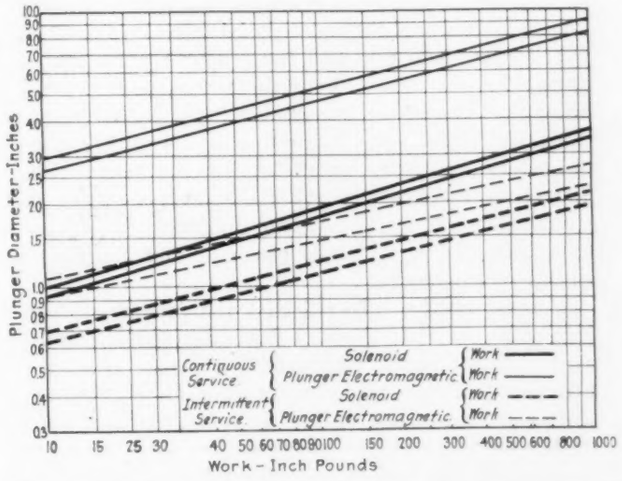


FIG. 6—PLUNGER DIAMETER* OF SMALLEST SOLENOID OR PLUNGER MAGNET FOR A GIVEN AMOUNT OF WORK

thickness of winding for an electromagnet used on continuous service, with a radiation of P_s watt per square inch of radiating surface, is:

$$t = a\left[\frac{NI}{L}\right]^2 \qquad (4)$$

For intermittent service the thickness of winding for an electromagnet with a rate of temperature rise of θ_s deg. C. per second is:

$$t = b\,NI/L. \qquad (5)$$

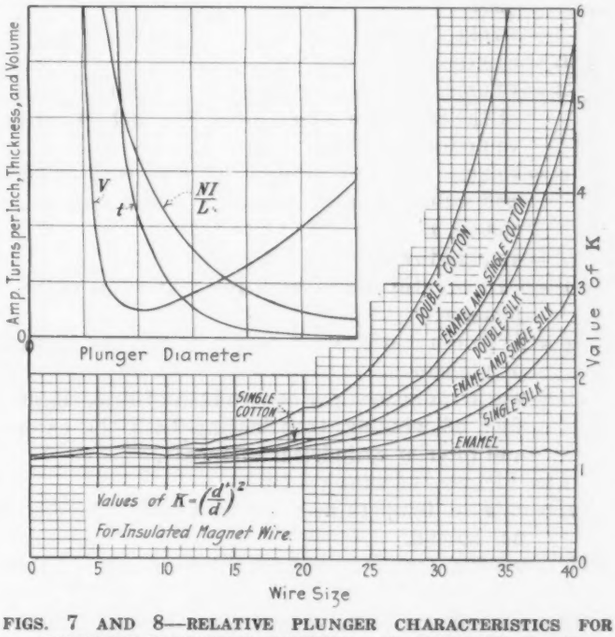
Volume, Weight or Cost of an Electromagnet.—For a given type of design the volume, weight or cost of the magnetic circuit of an electromagnet will, for different sizes of magnets, be proportional to the internal volume of the winding, or, from our notation, be equal to the internal volume of the winding multiplied by m.

The total volume, weight or cost of an electromagnet is:

$$V = V_c + V_w \qquad (6)$$

where $V_c = m_i \pi D t_i^2 L$ and $V_w = n\pi DtL = n\pi L(D_i t + t^2)$.

Procedure in Making Calculations.—If F, l or W is given, the value of inside diameter of winding, or diameter of plunger, may be computed, from which it is possible to calculate the ampere turns and thickness of



FIGS. 7 AND 8—RELATIVE PLUNGER CHARACTERISTICS FOR DIFFERENT PLUNGER DIAMETERS; AND CONSTANT K FOR DIFFERENT SIZE WIRES AND VARIOUS INSULATIONS

winding for the smallest, lightest or cheapest magnet.

If F and l are given, $NI/L = f(D_i, F)$, according to (2) or (3). From (4) or (5) the thickness of winding is $t = f(NI/L)$. From (6) $V = f(D_i, t, L)$; hence $V = f(D_i, F, L)$. For V to be a minimum $dV/dD_i = f'(D_i, F, L) = 0$. This expression solved for D_i will give an expression of the form $D_i = f(F)$. Similarly, if W is given, $D_i = f(W)$, and one or the other of these values gives the value of D_i to be used to calculate the smallest, lightest or cheapest electromagnet. The application of this theory will give general formulas for the design of solenoids and plunger magnets.

Summary of Working Formulas.—The working formulas tabulated herewith were obtained by using the following values in the general formulas:

For continuous service: Heat radiation, $P_s = 0.4$ watt per square inch.

For intermittent service: Rate of temperature rise, $\theta_s = 0.67$ deg. C. per second.

For solenoid work: $q = 12$, whence $L = 12D_i$; and $p = 6$, whence $l = 6D_i$.

*The upper line of each set is for a winding of No. 20 D. C. C. wire, while the lower line is for No. 0 D. C. C. wire.

†From "Solenoid and Electromagnet Windings," *Proceedings A. I. E. E.*, November, 1915.

SYMBOLS USED IN FORMULAS

$a = (0.5255/P_s)k \times 10^{-6}$.

$b = K\sqrt{\frac{0.01948}{\theta_s}} \times 10^{-3}$.

d = diameter of bare wire in winding (in.).
d' = diameter of insulated wire in winding (in.).
D = mean diameter of winding (in.).
D_i = inside diameter of winding (in.); also diameter of plunger.
F = total pull of magnet (lb.).
F_s = solenoid pull (lb.).
F_c = core pull (lb.).
g = lb. pull per square inch of plunger section (average value 0.009).
$h = l_{max}/L$, a constant for magnets of the same proportions.
$K = \left[\frac{d'}{d}\right]^2$, practically a constant for adjacent wire sizes.
l = stroke (in.).
L = length of coil (in.).
m = volume (cu. in.), weight (lb.) or cost (dollars) of the magnetic circuit per cubic inch of internal volume of winding.
n = volume (cu. in.), weight (lb.) or cost (dollars) per cubic inch of winding. (For volume, of course, $n = 1$.)
NI = ampere turns.
$p = l/D_i$ = ratio between stroke and diameter of plunger.
$q = L/D_i$ = ratio between length of coil and diameter of plunger.
P_s = watts radiations per square inch of radiating surface of winding (considering both the exterior and interior cylindrical surfaces).
t = thickness of winding (in.).
θ_s = rate of temperature rise in winding in deg. C. per second.
V = volume (cu. in.), weight (lb.) or cost (dollars) of magnet.
V_c = volume (cu. in.), weight (lb.) or cost (dollars) of magnetic circuit.
V_w = volume (cu. in.), weight (lb.) or cost (dollars) of winding.
$W = F \times l$ = total useful work from magnet (in.-lb.).
$W_s = F_s \times l$ = solenoid useful work (in.-lb.).
$W_c = F_c \times l$ = core useful work (in.-lb.).

For plunger electromagnet work: $p = 0.8$, whence $l = 0.8D_i$; and $h = 0.3$, whence $L = l/0.3$.

Selection of Formulas.—An electromagnet may be required to exert a given pull through a given stroke or perform a given amount of work. Examination of the pull characteristic of solenoid and plunger electromagnets, as shown in Figs. 1 and 2, indicates the following selection:

For a long uniform pull use a solenoid.

For a short strong pull use a plunger electromagnet.

For the performance of a given amount of work where the pull exerted should be uniform throughout the stroke use a solenoid.

For the performance of a given amount of work where increased pull toward the end of the stroke is an advantage use a plunger electromagnet.

Use of Formulas and Charts.—1. Make an assumption of what the wire size will be in the winding, and find the value of D_i for this wire size and for the given pull or work, from Fig. 1 or Fig. 2.

2. Find the other required quantities in the order given in the summary of working formulas.

3. Design the winding.

4. If necessary, repeat the above steps, using as trial wire size the value found in the design of the winding.

To use the NI/L charts draw a straight line between the given value of pull or work on the left-hand axis and the given value of plunger diameter on the right-hand axis. The intersection of this line with the center axis gives the required value of NI/L.

GENERAL REMARKS

The factor K which appears in all of the formulas for D_i is a quantity depending on the size of the magnet wire in the winding (which depends on the voltage on which the magnet is to be operated), and is equal to $(d'/d)^2$. The value of K for various kinds of insulation and sizes of wire is given in Fig. 8. It is not economical to use any of the kinds of insulation at points above the knee of the curve, as the proportion of insulation to copper is too great. At points below the knee of the curve the value of K is practically constant for adjacent sizes of wire. In the formula for D_i, K is governed by a fractional exponent, hence there may be a considerable error in the initial assumption of trial wire size without materially affecting the accuracy of the results. This is shown graphically in the D_i charts (Fig. 5 and Fig. 6) by the fact that the pair of lines for No. 1/0 and No. 20 wire for each case are close together; that is, there is only a small difference in plunger diameter for a given pull or work with a difference in the size of wire in the winding from No. 1/0 to No. 20.

The relation between the different variables in electromagnet design for a solenoid or plunger electromagnet for a given pull or work is shown in Fig. 7. These particular curves are plotted from formulas (1), (4) and (6), for solenoid pull and continuous service, but similar curves are obtained for the other cases. It will be noted that the curves for ampere turns per inch and for thickness show very large values for small plunger diameters and very small values for large plunger diameters, but the V curve shows a pronounced minimum value. It is the plunger diameter for this minimum value of V which is given by the formulas and charts in this paper.

It must not be inferred that the formulas given in this paper or the reference formulas for solenoid and core pull and work from which they are derived will give absolute results. The accuracy of the results obtained from the use of the derived formulas depends on the accuracy of the reference formula for the particular example, and this is affected by several factors, such as magnetic leakage, which cannot be easily evaluated. With proportions of magnets approximately as given, and with sufficient ampere turns per inch to saturate the plunger, the results will be amply close for practical use, especially as a factor of safety should be used to allow for the weight of plunger and for friction of plunger and mechanism. For a solenoid it is usually sufficient to use a value of F_s or W_s about 50 per cent greater than the required pull or work, and for a

WORKING FORMULAS FOR DESIGNING SOLENOIDS AND PLUNGER MAGNETS

	Service	CONTINUOUS		INTERMITTENT	
SOLENOID	Data given	Pull, F_s and length, $L = l + 6D_i$ = or > $12D_i$	Work W_s, length $L = 12D_i$, $l = 6D_i$ and $F_s = W_s/l$	Pull F_s and length $L = l + 6D_i$ = or > $12D_i$	Work W_s, length $L = 12D_i$, $l = 6D_i$ and $F_s = W_s/l$
	Internal diameter (in.) D_i	$(0.210KF_s^2)^{1/5}$ or Fig. 5	$(0.00536KW_s^2)^{1/7}$ or Fig. 6	$(0.0967KF_s)^{1/3}$ or Fig. 5	$(0.01344KW_s)^{1/4}$ or Fig. 6
	Ampere turns per in. length NI/L	$141.5F_s \div D_i^2$ or Fig. 3	$141.5F_s \div D_i^2 = 23.6W_s \div D_i^3$ or Fig. 4	$141.5F_s \div D_i^2$ or Fig. 3	$141.5F_s \div D_i^2 = 23.6W_s \div D_i^3$ or Fig. 4
PLUNGER ELECTROMAGNET	Data given	Pull F_c, length $L = l/0.3$	Work W_c, $l = 0.8D_i$, $L = l/0.3 = 2.67D_i$, $F_c = W_c/l$	Pull F_c, length $L = l/0.3$	Work W_c, $l = 0.8D_i$, $L = l/0.3 = 2.67D_i$, $F_c = W_c/l$
	Internal diameter (in.) D_i	$(4.26kF_c)^{1/3}$ or Fig. 5	$4.44KW_c^{1/4}$ or Fig. 6	$(0.0948K^2F_c)^{1/4}$ or Fig. 5	$(0.0527K^2W_c)^{1/5}$ or Fig. 6
	Ampere turns per in. length NI/L	$900\sqrt{F_c} \div D_i$ or Fig. 3	$900\sqrt{F_c} \div D_i = 1007\sqrt{W_c} \div \sqrt{D_i^3}$ or Fig. 4	$900\sqrt{F_c} \div D_i$ or Fig. 3	$900\sqrt{F_c} \div D_i = 1007\sqrt{W_c} \div \sqrt{D_i^3}$ or Fig. 4

plunger electromagnet to use a value of F_c or W_c about 25 per cent greater than the required pull or work. The solenoid pull of the plunger electromagnet, which was neglected in the plunger electromagnet calculations, gives an additional margin of pull for the plunger electromagnet.

Rating Artificial Lighting Systems

A Study of Conditions Affecting Efficiency of Illumination and Factors for Use in Calculating the Percentage of Normal Illumination That May Be Obtained

BY DAVIS H. TUCK

Illuminating Engineer, United States Public Health Service

WHEN making lighting surveys in industrial plants the equipment is found in various stages of deterioration. Lamps may be dirty and bulbs black; lamps may be used in reflectors that are too large or too small for the given size of lamp; lamps may be missing, broken or have their filaments "shorted." Reflectors may be dirty; reflectors may be loose, resting upon the bulb for support; the fixture may be defective owing to worn insulation; the reflector may be broken or missing. All of these items decrease the illumination to some degree, and it is important to gain an idea of the percentage decrease in illumination which may be ascribed to the combined effect of these factors. Obviously it would not be practicable to measure the loss of light due to each item for each lighting unit, as this would be an enormous task in even a small shop. Therefore an approximate system of rating becomes desirable. Such a system, which the writer has used in making lighting surveys in the industrial plants of Wisconsin, will be presented, together with comments on the results secured with it.

The term "efficiency of maintenance" was decided upon as a term which could be represented by a percentage figure and which would represent both the degree of maintenance that an artificial lighting system had received and the percentage of the available light that was being received on the working planes.

In formulating the discounts for various defects in maintenance it was decided to make the discounts conservative, so that a resulting efficiency of maintenance of 100 per cent would represent an installation which had received good care but which would not necessarily be in perfect condition. Thus a lamp may have been in use for 800 hours, and, while not a new lamp, it would not be blackened and would be rated at 100 per cent.

Carbon, metallized and tungsten-filament, mercury-vapor, arc, open-flame and mantle lamps become inefficient owing to the following causes: (1) Continued use; (2) dirt and dust accumulations on lamps and reflectors; (3) burn-outs and breaks; (4) reflectors becoming cracked, broken, loosened or missing, and (5) mechanical injury to connections. Various other items of deterioration take place so gradually that in many cases they are given no special attention in the practical economy of the shop.

Continued Use.—The life of a lamp is not, as is generally supposed, the elapsed time between its entering into service and its burning out. The life of a lamp is given by its manufacturers and is its economic life. Thus when a lamp burns a certain number of hours it may be shown that its energy consumption per light unit has increased to such a degree that it is economy to replace it with a new one.

Dirt and Dust Accumulations on Lamps and Reflectors.—It has been shown by actual measurements that

the loss of light due to absorption by dust and dirt for average conditions is about 50 per cent for equipment that has not been cleaned for four months; also that a small quantity of dust, so small as hardly to be noticeable, will cut down the light by 20 per cent.

Burn-outs and Breaks.—It is evident that a burn-out or break may cut down the light by 100 per cent. Often, however, a burn-out or break may be of such a nature that the light source does not fail entirely but that the light is greatly diminished.

Cracked, Broken, Loosened or Missing Reflectors.—The addition of a suitable reflector to a lamp generally adds about 50 per cent to the light delivered in useful directions. When a reflector is cracked or broken the light from the unit is diminished according to the nature of the damage to the reflector. When a reflector is loosened from the fixture or bent out of shape the distribution is altered and the efficiency of the reflector is lowered. It is evident that when a reflector is missing the light that would be gained by its use is totally lost.

Mechanical Injury to Connections.—The loss of light due to mechanical injury to connections will vary with the nature of the injury. Often the injury is of such a nature as to cause a flickering or intermittent light. It may cause a total failure of the light together with all other lights on the same circuit.

Lighting installations are designed to give desirable initial intensities at the work, and it is assumed that the equipment will be maintained so as to produce this intensity. From cost considerations the initial intensity is made as low as possible for work to be done efficiently and to insure prevention of eye strain and accidents. It is readily seen that when deterioration of the lighting equipment sets in the intensity of illumination falls off and that if this deterioration is not arrested serious efficiency losses follow. Often lighting systems are allowed to deteriorate to an extreme point, and nothing is done unless complaints come in from employees after the lighting facilities throughout the shop have become so poor that work has to be temporarily discontinued. The production losses from such circumstances when added up throughout the year greatly exceed the expense of systematic maintenance in advance.

Even when systematic maintenance is carried out the deterioration between inspections is marked, and for this reason it is desirable to allow a factor of safety when planning lighting installations, as is the general practice in other engineering problems. The author has frequently found general overhead direct and indirect lighting systems which after a trial of six months or more have been condemned by the factory management as unsatisfactory. In the majority of these cases the trouble lay in that the maintenance had been neglected, and in the minority it was due to faulty engineering. The stronghold that local lighting has in many factories to-day is due to the fact that the initial intensity is many times that required for the work at hand, and although deterioration is much more rapid for local light units than for overhead general units, the factor of safety has been made so large that only in extreme cases will the illumination fall below requirements. When local lights deteriorate to such an extent that they become unsatisfactory the individual workman usually makes repairs himself. Thus the trouble is not brought to the attention of the management. With overhead general lighting, however, the individual workman has no control over the units, and when the intensity fails, because of lack of maintenance, the job has assumed such proportions that the attention of the management is called to the matter.

In making illumination surveys of shops it was found desirable to note how well the lighting equipment was maintained and to arrive at an approximate figure by inspection that would denote the degree of maintenance. The term "efficiency of maintenance" is used to designate the percentage of the initial intensity that a lighting equipment will give, the loss in intensity being due to the lack of proper maintenance.

EXAMPLE OF APPLYING METHOD

The following table shows the method adopted for rating artificial lighting equipment. The efficiency of maintenance in each case represents approximately the percentage of light given by the equipment after the loss of light due to the corresponding condition is deducted:

Condition	Efficiency of Maintenance, Per Cent
Lamp dirty	80
Lamp very dirty	70
Lamp blackened, due to aging	80
Lamp too large or too small for reflector	80
Lamp missing, broken or having filament "shorted"	50
Reflector dirty	80
Reflector very dirty	70
Reflector cracked or bent	80
Reflector broken or missing	50
Connections loose, fuse out or drop cord bare	80

There follows an example taken from one department of a shop recently inspected and referring to general overhead units in a tool room: twelve units, lamps dirty, reflectors dirty; three units, lamps dirty, reflectors missing; two units, lamps dirty, reflectors very dirty; nine units, lamps very dirty, reflectors very dirty; one unit, lamps very dirty, reflectors missing; one unit, lamps dirty, reflectors clean; two units, lamps dirty and blackened, reflectors dirty.

To arrive at the efficiency of maintenance for the tool room referred to it is necessary to multiply the number of units having the given condition by the values of the efficiency of maintenance for those conditions, expressed as a decimal, and to take the weighted mean:

$12 \times 0.80 \times 0.80$	7.68
$3 \times 0.80 \times 0.50$	1.20
$2 \times 0.80 \times 0.70$	1.12
$9 \times 0.70 \times 0.70$	4.40
$1 \times 0.70 \times 0.50$	0.35
1×0.80	0.80
$2 \times 0.80 \times 0.80 \times 0.80$	1.02
30	16.57

$(16.57 \times 100) \div 30 = 55.2$ per cent efficiency of maintenance.

By measurement with an illuminometer the average illumination was increased in the ratio of one to two by bringing the efficiency of maintenance up to 100 per cent. By making such measurements in a large number of shops, it has been observed that the efficiency of maintenance of local units is approximately one-half that of the overhead general units.

A department of maintenance of artificial lighting equipment should be inaugurated in every factory and

workshop. This maintenance work should be made a part of the electrical department, which is in the best position to make periodic inspections of lighting equipment. Reports of inspections, using a system similar to the one outlined above, should be made to the factory manager and efficiencies of maintenance of 100 per cent maintained. The ratings given above are liberal, and efficiencies of maintenance of 100 per cent are not unreasonable.

By adopting such a practice a large economic waste caused by consumption of energy without adequate return in light production, losses due to decreased production, inferior products, accidents and defective eyesight could be avoided.

Work of Remodeling Old Hydroelectric Plant

The Prevalent Shortage of Coal Has Led One of the Pioneer Water-Power Plants of the New England States to Substitute Direct-Connected Equipment for Old Belt-Driven Machines

ALTHOUGH most of the United Electric Light Company's yearly output is derived from its team-turbine station at Springfield, Mass., the maximum utilization of water at the Indian Orchard hydroelectric station, about 7 miles (11.8 km.) distant, is of special importance lately because of the present shortage of coal. For this reason and because it is fundamentally advisable to utilize water power most efficiently, the company has remodeled the hydroelectric plant.

The station, which was one of the pioneer water-power plants of New England, was equipped with belt-driven units, including four Stanley inductor-type alternators, a General Electric direct-current generator, two pairs of Brush arc machines and three McCormick waterwheels. The arrangement of these units is indicated in Figs. 1 and 3. Two of the alternators, rated at 330 kw. each, were connected with two adjacent waterwheels, which in turn were connected with a countershaft as shown in Fig. 3. Owing to the losses in belting and shafting, it was impossible to develop more than 530 kw. with both units operating. The countershaft drove a direct-current generator furnishing railway energy.

The other two alternators, also 330-kw. units, were about 25 ft. (7.6 m.) apart on centers and were driven from pulleys at opposite ends of a third waterwheel. Each waterwheel consisted of two 36-in. (9.1-cm.) wheels mounted in a single casing with a central draft

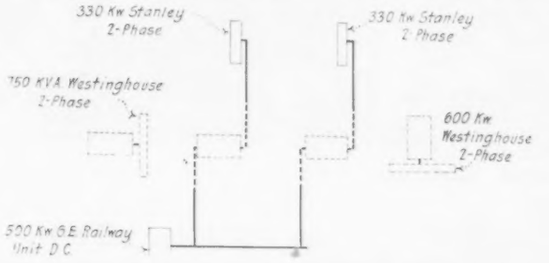
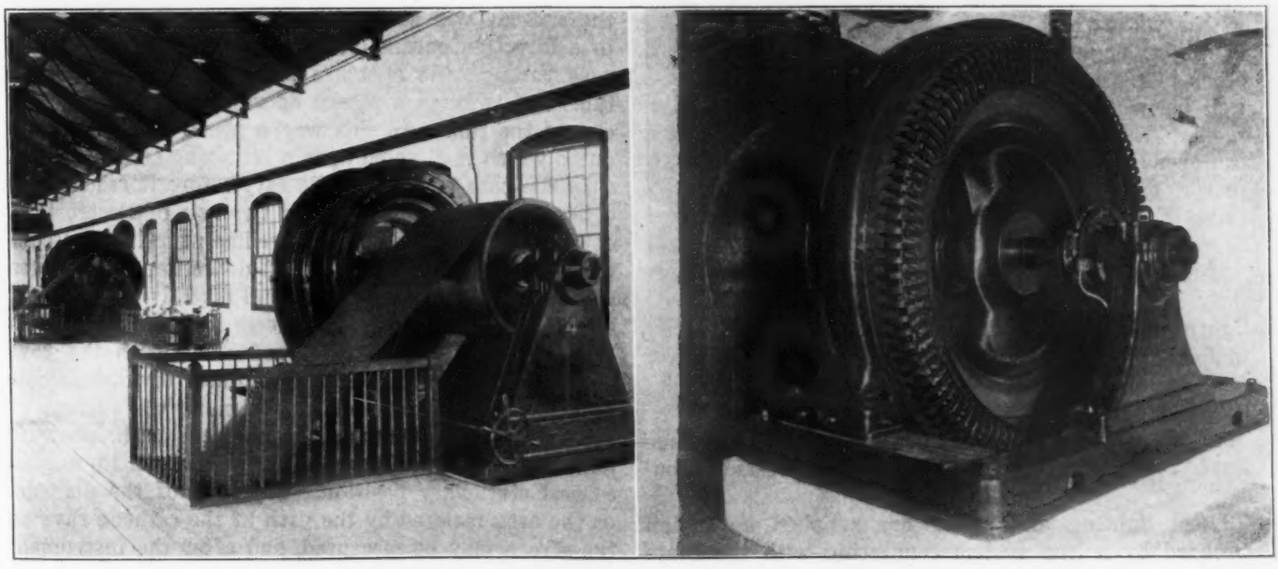


FIG. 3—LAYOUT OF EQUIPMENT IN PARTLY REMODELED PLANT

tube and were designed for 212 r.p.m. under a 35-ft. (10.6-m.) head.

In remodeling the station the last-mentioned alternators were replaced by one 750-kw. direct-connected Westinghouse alternator, the waterwheel connected with the old alternators being used to drive the new machine. This is shown in Fig. 2. The exciter for this unit has been installed in the belt recess of one of the old Stanley alternators which have been replaced (Fig.



FIGS. 1 AND 2—TYPE OF GENERATORS AND DRIVE USED IN OLD PLANT, AND ONE OF THE NEW DIRECT-CONNECTED GENERATORS DRIVEN BY OLD WATERWHEEL

5). While the 500-kw. direct-current generator attached to the countershaft is still being used, it will be replaced eventually by a 500-kw. Westinghouse rotary converter. The countershaft will be removed and two more 750-kva. Westinghouse generators will be substituted for the remaining inductor-type alternators, making a complete direct-current installation throughout.

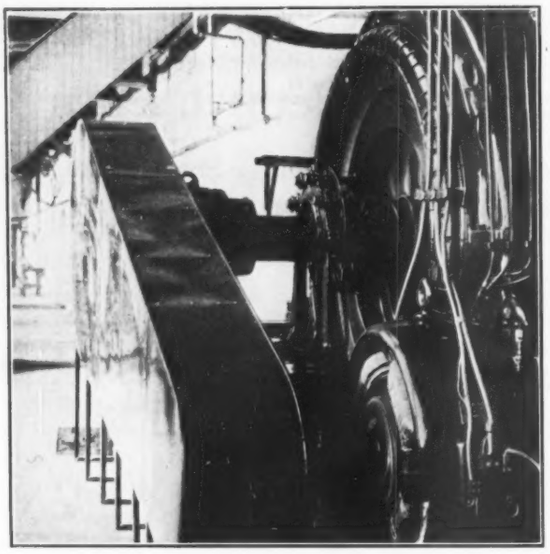


FIG. 4—DIRECT-CONNECTED ALTERNATOR WITH EXCITER AT ONE SIDE

Meanwhile, the waterwheels driving the inductor alternators and direct-current generator are assisted under low-water conditions by operating one of the alternators as a synchronous motor. While this arrangement does not permit very efficient operation, it serves as a makeshift pending the other changes contemplated.

The fifth generator indicated in Fig. 3 is a 600-kw. direct-current Westinghouse alternator which was installed several years ago in connection with a waterwheel placed at right angles to the other prime movers in a well below the operating room. This machine is equipped with a belt-driver exciter, the belt being inclosed in a guard, as shown in Fig. 4.

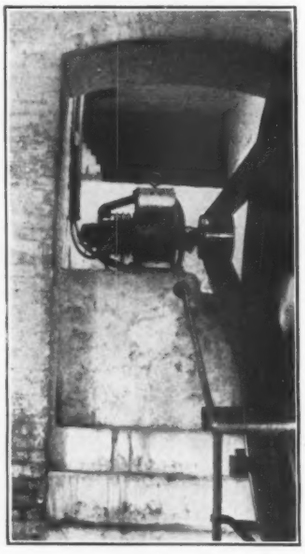


FIG. 5—OLD BELT-WAY ACCOMMODATES EXCITER FOR ALTERNATOR

The major portion of the Springfield street-lighting service was originally supplied from Indian Orchard by brush-arc machines belted to countershafts, but this load has gradually been transferred to the State Street plants in the interests of economy.

Local lighting and power are supplied at Indian Orchard by a loop system connecting with the State Street and Bircham Bend plants of the United Electric Light Company.

Filament Lamps for Optical Projection

Emerson L. Clark of Lakewood, Ohio, suggests, in patent No. 1,221,418, a means of effectively utilizing all the light rays of a filament lamp for projecting purposes. A light intensification of nine times is claimed over the ordinary methods of lighting. The light globe consists of two hemispherical parts inclosed in water-jackets. These hemispherical parts have their interior surface highly polished and silvered or coated with any other highly reflecting material. The incandescent support is cemented or otherwise fastened, and the terminals are sealed in order to prevent a short circuit. The disk which serves as the window is placed in the hemispherical part, and the two parts are securely fastened together to make an airtight joint. The fluid cooling of the metallic hemispherical part prevents the temperature of the entire inclosure from increasing to any considerable extent. Since the temperature of the glass, which has the lower coefficient of expansion, will be greater than the temperature of the fluid-cooled metal, the difference in the coefficients of expansion of the glass and the metallic part will thus be compensated. By keeping the polished surface cool no loss in reflective power is experienced.

Cathode-Ray Oscillograph Measures Power

In patent No. 1,219,961, recently issued to Irving Langmuir of Schenectady, N. Y., not only are the irregularities of the original vacuum tube overcome but an exceedingly effective screen is proposed which does away with all difficulties inherent in the usual fluorescent screen.

Contrary to the idea of employing a small amount of ionizable gas in the Braun tube to conduct the electric discharge current, the Coolidge idea is embodied. In this an incandescent cathode is employed emitting negative electrons in an "atmosphere" as low as one-hundredth of a micron. This high degree of exhaustion is effected by means of the Caede molecular pump.

A perforated plate is arranged to close one end of the tube to serve as the main anode for the source of energy. The greater part of the electrons given off by the cathode will strike the plate, and those traveling in a direction parallel to the axis of the envelope will pass through the aperture in the plate, through the tube, and through a second aperture, closing the other end of the tube. In this way a pencil of rays is produced which is directed upon a reflecting screen.

In the path of the cathode ray, before it reaches the deflecting screen, are arranged two sets of electrostatic deviators which cause the traveling negative electrons to take up two types of lateral deflection compounded at right angles to each other and directly proportional to the voltages and current effects it is desired to outline. In this manner, after reflection, with the rays impinging on a screen having a finely divided deposit of volatilized tungsten or molybdenum, the surface of the screen traces out an incandescent path, showing how the cathode-ray pencil is deviated from its normal central stationary position. The area of the diagram or the area inclosed by the path of the cathode rays on the screen may be measured, and after the instrument has been suitably calibrated the power in the circuit may be computed from this area.

Importance of Flexibility of Boiler Control

Separate and Flexible Air Control a Means Toward Securing Maximum Efficiency Over Wide Range of Loading — More Extensive Utilization of Radiant Energy from Fuel Bed Strongly Advocated

BY VICTOR B. PHILLIPS
The Cleveland (Ohio) Railway Company

SOME engineers do not appreciate the nearly equal importance of rating and efficiency as factors bearing upon the cost of producing steam. For example, in the power plant of a typical street railway about 40 per cent of the cost of producing steam is for fixed charges and labor, while about 50 per cent is for fuel. The relative importance of these items is, of course, a function of the plant load factor; but there are few plants where the load factor is sufficiently high to reduce fixed charges and labor to less than 35 per cent of the total cost of steam production. It is therefore advisable to look to the reduction of these charges as well as to increase in efficiency in improving boiler performance.

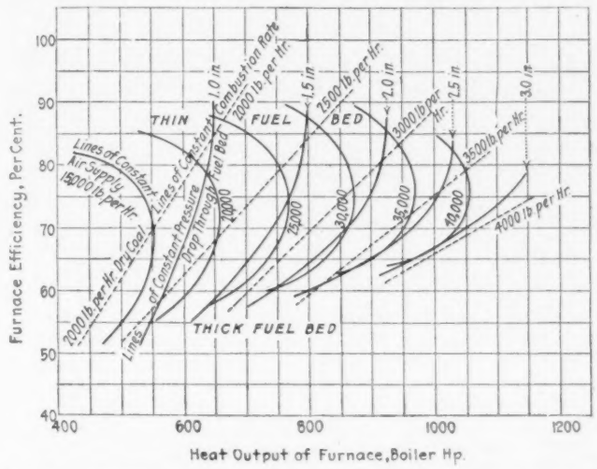


FIG. 1—FURNACE PERFORMANCE AT DIFFERENT OUTPUTS WITH DIFFERENT RATES OF AIR SUPPLY AND THICKNESSES OF FUEL BED

In the formulation of a policy for the construction and operation of a boiler plant data of two kinds are essential. First of all it is necessary to know the cost of fuel, especially in relation to the general price level, and to know also the load factor. In the second place, data on the maximum efficiency attainable with the boiler equipment throughout a wide range of loads must be available. The conditions whereby such efficiencies may be obtained must be known. With these data and only with these data may the engineer intelligently decide upon the amount and type of equipment suitable to conditions and upon the proper methods of operation and loading. It is perfectly safe to say that the boiler room of the average power plant offers tremendous opportunities for saving. It is here that systematic study is most worth while. It is also safe to say that much of future development will be in the way of increased flexibility of control. For example, uniformity of performance over a wide range of loads is an important characteristic of the modern turbine. The reason for burning pulverized coal or oil under boilers, in some respects an expensive process, is primarily to insure entire flexibility of control.

The present barriers to flexibility in the boiler plant are to be found in the furnace and not in the boiler. The ability of a boiler to absorb heat depends upon the temperature and amount of gas passing over the boiler surfaces. Temperature is by far the most important of these two factors, for the reason that it is essential to every mode of heat transfer, be it conduction, convection or radiation. The importance of radiation, which is a mode of transferring heat from the furnace to the water that depends solely upon temperature difference (assuming, of course, a constant condition of boiler surfaces), has been recognized only very recently. For example, in the old-style settings with Dutch ovens very little attention was directed to the efficiency and effectiveness of heat transfer by radiation, whereas in the most modern settings a very large part of the total heating surface is exposed to the radiant heat of the furnace. The growth of such practice makes the factor of gas velocity of secondary importance.

Such being the case, a flexible furnace, in which the conditions governing combustion and therefore temperature may be properly regulated through a wide range, will give uniform boiler efficiency. Hence it follows that the furnace is the problem demanding solution. It must be made to operate efficiently not only at the single load for which it is rated, but with very nearly as good performance at, say, 250 per cent of rating.

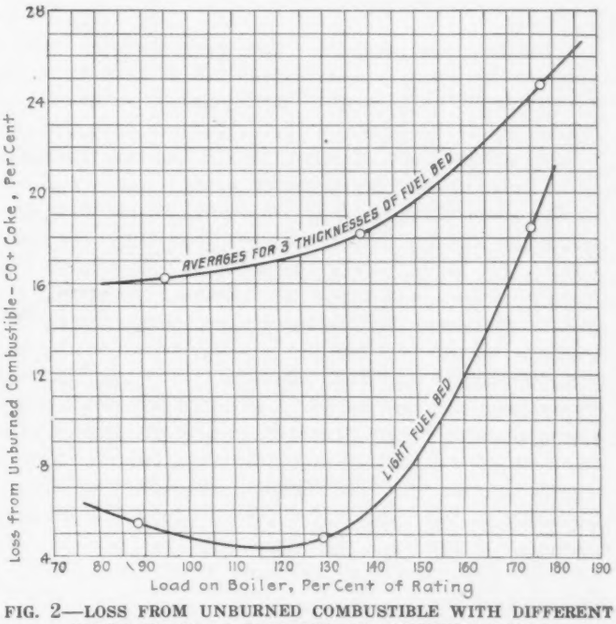

Loss from Unburned Combustible - CO+ Coke, Per Cent
Load on Boiler, Per Cent of Rating
AVERAGES FOR 3 THICKNESSES OF FUEL BED
LIGHT FUEL BED

FIG. 2—LOSS FROM UNBURNED COMBUSTIBLE WITH DIFFERENT THICKNESSES OF FUEL BED AT DIFFERENT LOADS

With a view to discovering operating limitations and the conditions giving maximum efficiency, and also

to improving stoker and boiler setting design, the writer conducted an exhaustive series of tests for the Cleveland Railway Company. The equipment tested consisted of a Taylor six-retort stoker with extension grate* set under a 512-hp. Babcock & Wilcox boiler. Nine main tests were conducted, consisting of a test for each of three different fuel-bed thicknesses with each of three different loadings. The most extreme conditions of operation were studied, with clear-cut and striking results. A description† of procedure and tabulations and graphs of test data have been published elsewhere, together with some discussion of the fundamentals of furnace and boiler operation and the system of testing adopted. Some of the points brought out in that paper will be supplemented and amplified in this article, which will also treat of test results applying to the furnace, or "heat liberator," and the boiler, or "heat absorber."

The Furnace

A fundamental factor in the efficient burning of any fuel is the time required for the completion of the combustion process. Regulation of the time element is essential to complete flexibility of control. Inability to regulate it, however, is an inherent characteristic of many automatic stokers because the grate area is usually a fixed quantity. In most stokers the time of transit of coal varies inversely with the stoker speed, so in order to burn the increased supply of coal the total air must be increased and a greater rate of combustion must be realized. The inflexibility in time regulation must be compensated for by great flexibility in the air supply. As the load on a stoker is varied, the amount of air supplied to the several parts of the grate surface must be varied. Furthermore, it is far from true that changes in this supply in these several parts should be in the same relative proportions for all loads.

Consider, for example, the comparatively simple chain-grate stoker. The dimensions of this grate are proportioned to give good performance at rated load with a particular grade of fuel. Increase of load necessitates an increase of speed or of fuel-bed thickness, or of both, as well as increased draft. For a fuel bed of the same thickness and resistance to air flow doubling the amount of air requires four times as much draft. If, as is rarely the case, the increased fuel supply is obtained solely by increase of speed, the greatly increased draft blows holes through the lighter portions of the fuel bed, or at least reacts more than proportionately in those sections where partly consumed coal has less weight. At first the relation between resistance and weight of fuel is the same at the front as at the back of the grate, but this relation is shortly disturbed. The draft, increased four times, concentrates its destructive efforts upon the weaker portions of the bed. The grate proportions become entirely improper, and recourse must be had to a thicker fuel bed.

Suppose now that the refuse on the grates at the bridge wall amounts to 20 per cent of the weight of coal fired. Then doubling the fuel-bed thickness perhaps doubles the weight of refuse at the rear of the grate. But this increase in actual weight is only 20 per cent of the actual increase of weight on the front grates. The large increase in the resistance of green coal to air of combustion makes the rate of combustion relatively slower in the front so that the more anterior portions build up in thickness. Thus difficulty from holes may be reduced, but a great loss in coke to the ash pit results. Once more the grate proportions are improper. From this lengthy citation it is at once

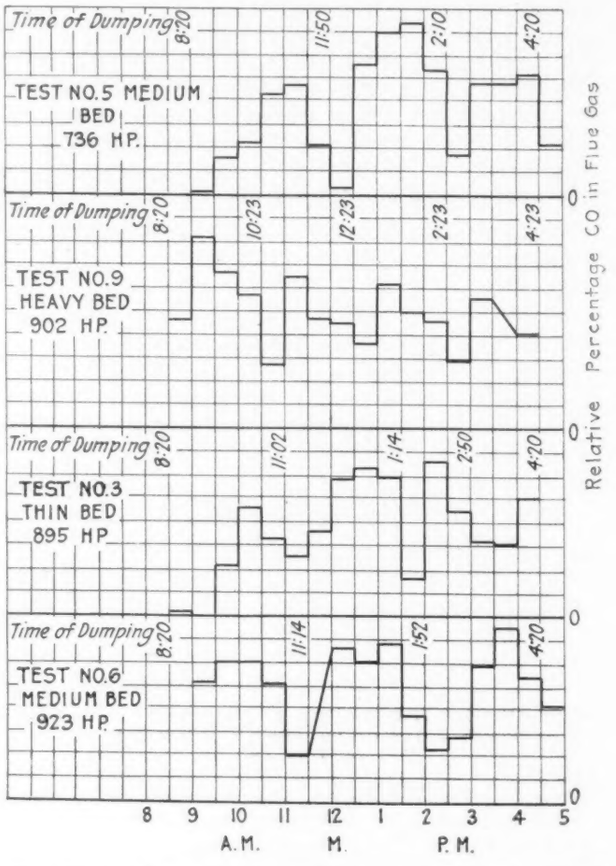


FIG. 3—RELATIVE PERCENTAGES OF CO IN FLUE GAS WITH DIFFERENT OUTPUTS AND FUEL-BED THICKNESSES

evident that much of the above difficulty could be removed by regulation of the air supply independently in the several parts of the furnace.

Similar conditions exist with some underfeed stokers. With these stokers the lower grates, especially the extension and dump grates, have not an adequate and independently controllable supply of air with which to burn the combustible delivered to them at overloads. Such a condition becomes accentuated when the combustible received at a higher rate than burned piles up and still further shuts off the air supply.

Two sets of curves are presented herewith to demonstrate this point further. The first set show the relation of CO to time of cleaning fire or, in other words, to the amount of coke and ash on the lower grates. These curves indicate that the CO comes for the most part from these grates. Obviously the solution of the difficulty is more air, but the air supply to the extension grates comes from the main air boxes and cannot be independently regulated in some cases, so it is increased or decreased along with the air to the rest of the grate surface. The second set of curves show the relation of total loss from incomplete combustion to load. They constitute the most effective kind of argu-

*Installed in 1913-14.

†*Journal*, Amer. Soc. Mech. Eng'rs, May, 1917.

ment on the shortcomings of the automatic stoker, though at the same time the writer does not hesitate to rank the Taylor stoker with the very best. This inflexibility is characteristic of the present status of the stoker operation.

But progress has not been lacking in recent years. Compared with some chain-grate and overfeed stokers favored a few years ago, the present forced-draft underfeed stokers are a great improvement. Not only do they give better efficiency, but, what is in most plants much more important, they are vastly more flexible. It is perfectly possible to follow the load of a railway power station with some of these stokers, or, in other words, trace a boiler load curve to correspond to the station load curve. Such flexibility is essential on some electrified railroads, of which the Norfolk & Western system is an example. In this case the boilers are made to undergo tremendous fluctuations in loading.

While considerable latitude in loading has become possible with the modern stoker, it is still impossible to maintain uniformly high efficiencies or to avoid various difficulties over a wide range of loads. One difficulty is the formation of clinker, the conditions described above being very favorable to clinker formation. As the ash and coke pile up on the lower grates including the dump grates and the air is cut down, high temperatures result. The ash becomes fused across the dump grates and fastens onto the bridge wall. Excessive difficulty in cleaning and destruction to the furnace lining are the consequences.

EFFECTS OF OVERLOADS

In the course of the tests run by the writer another point was developed in connection with sustained overloads. It was found that the best results by far were obtained when a comparatively light fuel bed was used. This was true to a surprising degree even at a heavy overload. With the boiler loaded to nearly 200 per cent of rating (average for eight hours) the thin fuel bed was easier to maintain in good and uniform condition and the resulting efficiency was higher than with either the heavy or medium thicknesses of fuel bed. Such being the case, it seems desirable in carrying sustained overloads to have more stoker engine capacity and to rely less upon the burning down of a heavy fuel bed.

Stokers, such as the Taylor stoker, depend to some extent upon the dump grates for the burning out of coke. The air for this combustion is drawn up by the draft maintained in the combustion chamber. In some tests for the determination of infiltered air the writer tried operating with a practically balanced draft, *i.e.*, less than 0.10 in (2.54 mm.) of water draft in the furnace. As a result, flames were driven out through the under sides of the dump grates, which consequently became red hot. While a minimum draft is desirable, many of the grates were burned out. This experience suggested the advisability of sealing the ash pit and by means of a by-pass from the air ducts creating a slight pressure. By this plan a minimum draft may be maintained without serious escape of air through the dump grates.

Nevertheless, a comparatively slight draft in the furnace means a considerable draft back through the setting with the consequent deleterious effects of infiltered air. A series of tests which were necessarily inaccurate showed that this infiltered air for the setting already discussed was 3500 lb. (1587.6 kg.) per hour with a 0.30-in. (7.6-mm.) draft. This setting was new and in excellent condition, and the results take no account of air infiltered when cleaning doors were open. The value given is interesting as indicating what the infiltered air must be in a poorly maintained setting where natural draft is employed.

The second installment of this article, which will dwell on the boiler as a heat absorber, will be printed in a later issue of the ELECTRICAL WORLD.

UNUSUAL UNDERGROUND SYSTEM AT CINCINNATI

Large Ducts and Cables, Rugged Construction and Provisions for Watertight Construction and for Admitting Water for Cooling Ducts

Construction work is at present well under way on the underground transmission system which will connect the new power station of the Union Gas & Electric Company of Cincinnati with its substations. Some of the minor details yet remain to be worked out, but a general statement of the problems encountered and the methods to be employed in its solution are given in this article.

The conduit leaves the power house in four runs of ten ducts each. The ducts at this point are arranged in groups two wide and five high. At a distance from

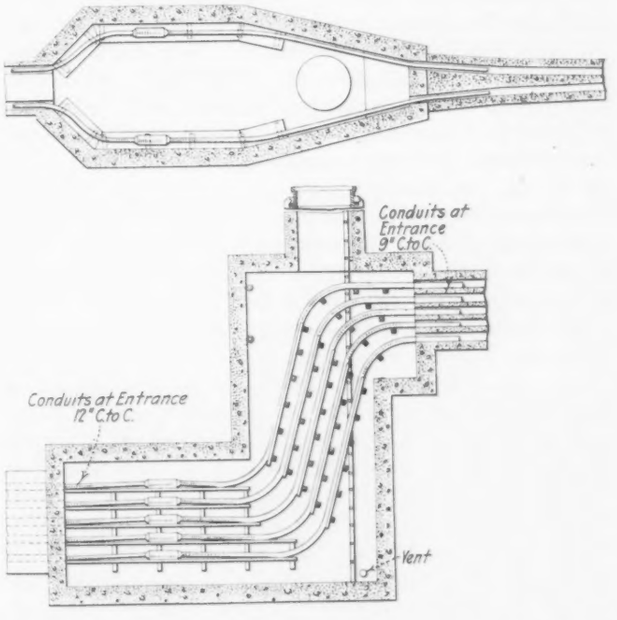


FIG. 1—STRAIGHT-LINE TWO-LEVEL MANHOLES OF LARGE SIZE HAVING REINFORCED-CONCRETE WALLS

the power house, where the number of ducts is reduced, the same width is maintained, the number of layers being less. This arrangement was selected for these reasons: It permits economical construction; it is rigid against vertical loads or stresses; it gives large radiating surface, and it allows the cables in the manholes to be separated and spread to the sides of the manholes without crossing each other. When the system has

been completed it will comprise 674,000 duct feet, apportioned as follows:

20,000 ft. (6,096 m.)	10-duct fiber conduit	× 10 =	200,000 duct feet
17,000 ft. (5,181.6 m.)	10-duct tile conduit	× 10 =	170,000 duct feet
16,000 ft. (4,876.8 m.)	8-duct fiber conduit	× 8 =	128,000 duct feet
6,000 ft. (1,828.8 m.)	6-duct fiber conduit	× 6 =	36,000 duct feet
35,000 ft. (10,668 m.)	4-duct fiber conduit	× 4 =	140,000 duct feet

In the aggregate this will mean the installation of 94,000 linear feet (28,651.2 m.) of conduit, or 674,000 linear feet (20,543.56 m.) of duct.

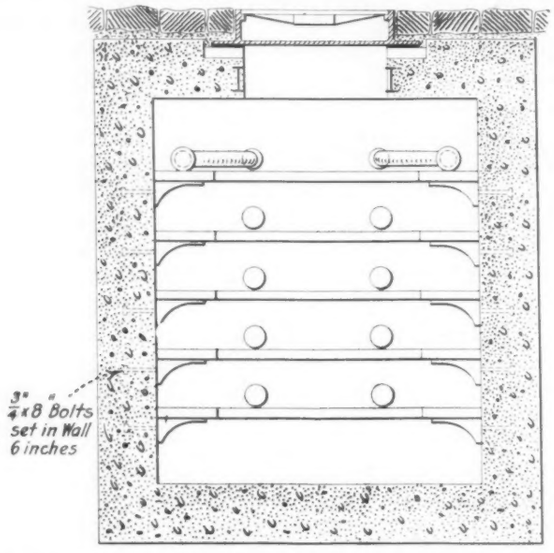


FIG. 2—ORDINARY STRAIGHT-LINE MANHOLES, SHOWING HOW CABLE WILL BE RACKED

Aside from the great length of duct involved, several other factors enter to make the Cincinnati company's underground problems important. The rough character of the territory traversed, for example, adds to the difficulties. Furthermore, part of the system will probably be under water each year. Besides this, the cables themselves are of very large size. In fact, they will be the largest three-phase, 13,200-volt cables yet built. They measure 3.25 in. (31.75 mm.) in outside diameter and contain three 400,000 circ.-mil conductors. In all cases they will be pulled into 4.5-in. (116.3-mm.) duct laid in concrete, with a thickness of 3 in. (76.2 mm.) of concrete between adjacent ducts and 3 in. (76.2 mm.) of concrete between the ducts and the outside of the incasement. The fiber conduit, which is 5/16 in. (7.93 mm.) thick, was especially made for the Cincinnati job. Fiber was selected because of ease and speed of laying, better alignment, ease of cable pulling and removal, non-fusibility and lowest total conduit cost. The tile duct was purchased at a time when it was impossible to get fiber duct large enough for the job.

The problems occasioned by the unusual topography of the city and by the existence of other utility construction in the streets were generally solved by building two-level manholes. Some of these are really mammoth structures. One, for instance, is 20 ft. (6.09 m.) long by 28 ft. (8.53 m.) deep by 7 ft. (2.13 m.) wide, with reinforced-concrete walls 1 ft. (0.3 m.) thick. There are many 14-ft. (4.27-m.) manholes. In sections where changes of level were necessary it proved economical to run the duct into the manholes at one level and out at another. The difference in level in some instances was as much as 12.5 ft. (3.95 m.). In changing levels the cables will be supported on channel-iron troughs, additional protection to the sheath being provided by the asbestos and cement fireproofing which will be applied in all manholes.

In designing all manholes on the system care was taken that they should be made large enough to take care of future growth. It is the hope of the company's engineers that none will need to be rebuilt at least within the coming decade.

In that section of the city which is flooded each year the entire underground system will be made watertight. This is necessary to prevent the silt carried by the overflowing river from clogging ducts and manholes. Exclusion of water and silt will be accomplished by the use of double manhole covers made in two parts. An inner cover will carry a gasket to keep out water. The outer cover will withstand the traffic strains. To prevent explosions from gas that collects in manholes natural ventilation by means of static-head differences will be normally used, assisted by local forced ventilation when and where necessary.

On account of the large power-carrying capacity of the cables and the consequent high temperature that may be expected in the ducts, two cooling schemes have been worked out. Near the power house where the conduit passes through a cinder fill, arrangements will be made to circulate water down through the cinders and over the outside of the conduits when thermometers indicate dangerous temperature rises. Besides, it will be possible to turn city water into the underground system at several points in the system and permit it to flow by gravity through ducts and manholes toward the power house, where it can be drained into the river. By the installation of thermometers in pipes at various points on the system it is expected that the necessity for turning in water can be foretold with certainty. The fact that all ducts drain toward manholes and that very cold weather is not experienced at Cincinnati will permit of this practice, it is thought, even in winter.

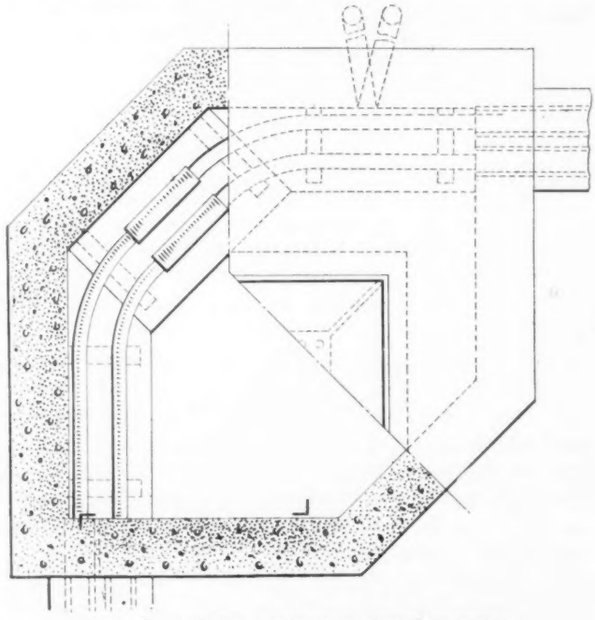


FIG. 3—CORNER MANHOLE CONSTRUCTION

The system is being built under the direction of C. R. McKay, consulting engineer for the Union Gas & Electric Company. Sargent & Lundy, Chicago, are constructing engineers.

STATION AND OPERATING PRACTICE

A Department Devoted to Problems of Installation, Operation and Maintenance of Equipment for Economical Generation and Distribution of Electrical Energy

OBJECTION TO BONUS SYSTEM IN BOILER ROOM OF PLANT

A Chief Engineer Asserts that This System Promotes Dishonesty—Advises Using Devices for Convenient Operation and Checking Results

E. H. Perry, assistant chief engineer of power plants for Sears, Roebuck & Company, Chicago, believes it is fundamentally wrong to employ a bonus system for encouraging economical operation in a power plant. In his opinion such a system cannot help but induce the men in the plant to resort to dishonest practices in order to earn the bonus. In one instance which came to his attention a locomotive engineer reported a run of several thousand miles on a quart (0.946 l.) of cylinder oil, when in fact he had been oiling his engine with lard oil stolen from lanterns. In another case where a bonus was paid on waste, in order to reduce needless consumption thereof, one man was found to have his locker full of waste which he had accumulated at the expense of his fellow workers. Still another observation indicated that coal scales were ingeniously tampered with to make the coal consumption low enough to earn the bonus.

The better plan, Mr. Perry believes, is to provide the boiler-room force with the best devices for convenient operation and accurate checking of results, and then to hold the force responsible for getting the best results which the plant seems to be able to give. To this end the power plant of Sears, Roebuck & Company has been equipped with automatic coal-weighing scales, flow meters, automatic feed-water regulators and such other devices as have shown themselves worthy of consideration. Conditions have been worked out so well that now one man takes entire care of ten boilers.

MOTOR AIR GAPS AND ALLOWABLE BEARING WEAR

Small Clearance Between Rotor and Stator of Induction Motor Limits Amount of Wear Permissible in Bearings

BY E. C. PARHAM

Failure of operators to appreciate the fact that the air gaps of small induction motors are usually only a few thousandths of an inch often leads directly or indirectly to the trouble most common to these motors—rubbing of the rotor on the stator. Bearing wear equal to only the bearing clearance of direct-current motors will let the rotor down on the stator.

In one instance an inspector was called to look at a repulsion-induction motor on the inside of which sparks like those from an emery wheel occasionally could be seen. Inspection disclosed the fact that a very small area of the rotor which was not perfectly cylindrical had been striking a few laminations that projected from a part of the stator. Whether there would be contact or not depended on whether the rotor was at one end of its end-play travel or the other. In any event the pinion-end bearing lining had worn almost to the safe limit. If there had not been those few projecting laminations which gave a timely warning, the rotor probably would have been seriously damaged later.

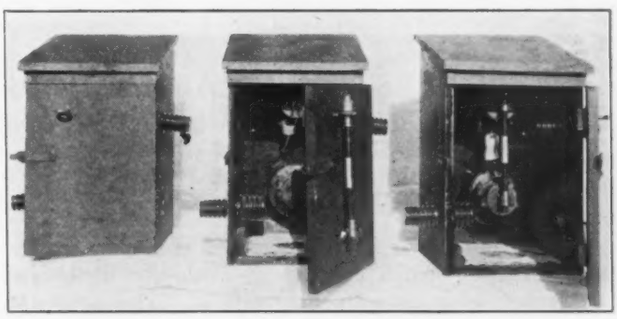
Buy a Bond for Liberty

PROVIDING FOR SAFETY IN HANDLING EXPULSION FUSES

Screw Eye Is Placed on Door of Cut-out Box to Accommodate Fuse Holder and Discourage Laying Fuse in the Box

On the lines of one Western company two linemen were engaged in inspecting 11,000-volt transformer installations. One of the linemen climbed a pole, opened the boxed-in cut-out door and pulled the holder in the usual way with a treated wood hook stick. He then removed the holder from the stick and laid it on the bottom of the open cut-out box. In some manner the end of the cut-out came in contact with the bare terminal clip and the lineman received a very severe shock. He was saved from death by the prompt and efficient resuscitation methods of his companion, but spent many weeks in the hospital recovering from the burns received.

Inquiry developed the fact that many employees were laying fuse holders on the bottom of cut-out boxes after they had been pulled. To prevent a recurrence of this form of accident, this company has placed a screw eye in the front of the door of each cut-out box, as shown



CUT-OUT BOX FITTED WITH SCREW EYE TO HOLD FUSE

in the accompanying illustration. The eye is sufficient in size to accommodate the tube but not the bulb of the holder, which is of the expulsion type. Linemen are instructed upon removing a holder to slip it into the screw eye, where it may be placed in safety. The eye also provides a convenient handle for opening the door.

ARRANGEMENT USED FOR LIFTING INTAKE SCREENS

Old Boiler Tubes and a Chain Hoist a Much Simpler and Cheaper Method than Usual Permanent Structure at Intake Mouth

In contrast with the usual permanent intake-screen lifting apparatus used by small stations the tripod and chain hoist illustrated herewith is thought to be a model of simplicity and inexpensiveness by the company using it. It is in service at the intake of the 1000-kw. steam-turbine plant of the Crawfordsville (Ind.) Electric Light & Power Company. The outfit consists of three spliced lengths of old boiler tubing and a 1-ton (0.9-t.) chain hoist. The two legs of the tripod which are adjacent to the stream are of equal length, but the third leg, which rests back from the bank of the river, is longer than the others to give workmen plenty of room to handle outcoming or in-

SIMPLE DEVICE FOR LIFTING INTAKE SCREENS

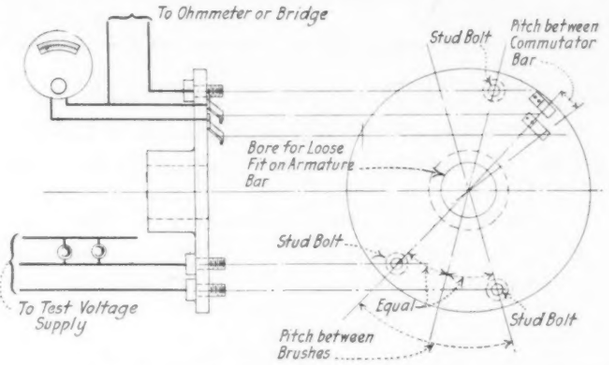
going screens. F. H. Miller, manager of the Crawfordsville plant, states that the outfit performs its work admirably and was very inexpensive to construct.

DEVICE THAT FACILITATES TESTING OF ARMATURES

Rotary Terminal Block with Contacts Can Be Slipped on Armature Shaft and Used to Assist in Measuring Resistance, Etc.

BY EVERETT E. GEORGE

For testing armatures the writer has made a rotary terminal block which consists of a wooden disk with three stud bolts extending through it. The bolts are equidistant from the center hole, which is bored to fit loosely on the armature shaft. Two of these bolts should be spaced so they will fall at or near the brush joints when the device is slipped on the commutator end of the armature shaft, and the third bolt should be equidistant from them but also on the commutator. When testing, the armature is set on end, with the commutator up and the shaft vertical. The testing voltage is applied across the first two bolts or legs. At a brush point corresponding to the third leg a spring finger is attached to the disk. Across this finger and the third leg is connected a bridge or ohmmeter for measuring resistance between brush points. One commutator bar distant from this finger is a second finger. Across these two fingers is connected a millivoltmeter. Each finger



ARMATURE-TESTING CONTACT BLOCK THAT SLIPS OVER SHAFT

should be wider preferably than the mica between segments.

By using long flexible leads this terminal block may be revolved once, and if the armature is in good condition, the millivoltmeter will give a constant reading, provided the fingers are properly adjusted. With the block stationary and the testing voltage off, the resistance between brush points may be read. This device may be modified to suit the type of armature most frequently tested. By the use of this rotary terminal block the time for testing armatures can be reduced from several minutes to ten seconds.

To Buy Bonds Is the Easiest Way

INDICATING FUSE UNNEEDED UPON SECONDARY NETWORK

Experience Shows that Prompt Attention to Customers' Complaints Facilitates the Location of Burnt-out Fuses

Following an article entitled "Parallel Operation of Distribution Transformers" in the Aug. 25, 1917, issue of the ELECTRICAL WORLD, in which S. B. Hood, superintendent of distribution for the Northern States Power Company, Minneapolis, Minn., described a special sheet-copper fuse for the secondary network, some question arose as to whether or not it was possible to tell from the ground whether one of these fuses had blown. In a letter from Mr. Hood he points out why it is not necessary for the fuses to be of an indicating type. Mr. Hood's letter follows:

"It is hardly possible to tell when one of these fuses is blown except by close visual inspection. In most cases the copper fuse link melts over a very small section near the middle. This melted space is generally too narrow to be readily visible from the ground.

"Some years ago I used this device as a visible indicator by bridging a very small copper wire across the fuse link. This indicating wire, being on longer centers than the main fuse, did not blow unless the main link fused first. The indicating wire was so delicate, however, that it readily became broken, and the actual

number of failures of the main fuse was so small that it was finally decided that the indicator was more trouble than it was worth.

"In the operation of interconnected secondary networks the operating department can depend upon the company's customers indicating very promptly when a fuse blows. If the customers' complaints receive immediate attention, defective fuses or transformers can generally be picked up on the first night the fuse is out. On the lines of the Northern States Power Company we try to maintain our secondary lamp voltage at from 114 volts to 117 volts, the latter being received by consumers very close to a transformer. As the load is evenly distributed along the secondary network, it follows that where a transformer fuse fails for any cause, the consumers close to this transformer will get a secondary drop approximately four times normal. In other words, instead of getting 117 volts at their lamps they will get about 105 volts. This sudden drop in voltage will almost surely result in one or more consumers complaining of poor light at the same time.

"It is our practice to have the trouble clerk answering these calls inquire if the light has been getting poor gradually or has been noticed to become poor suddenly. If the customer reports the latter condition, we know almost to a certainty that the fuse at the nearest transformer is out. A troubleman is then sent at once to investigate and correct the defect. We believe that chasing trouble on interconnected secondary network is a very simple problem."

GRAPHIC COMPROMISE FOR CONDUIT CONSTRUCTION

Method of Avoiding Confusion and Inconvenience in Complying with Ruling Applying to Circular Area

By a ruling of the Worcester (Mass.) wire department last July it became necessary for all new house-wiring construction within a radius of one mile from the City Hall to be made in iron conduit. In laying out such work the engineers of the Worcester Electric Light Company found that if the geographical mile circle should be taken as the actual limit of iron construction, much confusion and inconvenience would result. On account of the street irregularities, certain houses lie partly within and partly without the mile circle, and next-door neighbors in the same block would in some cases be affected by the ruling and in others not.

To meet this condition and secure a positive definition of a workable character which should limit the iron construction area, the company's engineers held a conference with the officials of the wire department, and it was agreed that a compromise should be made. In other words, an irregular boundary was selected that approximately coincides with the "mile circle" but parallels the street lines so that residences on each side of the streets included will benefit by the ruling. In some cases the iron conduit area is extended beyond the mile circle, and in others it is reduced. Thus certain park land lying within the mile circle is not included in the prescribed area, while in other cases certain populous streets have been included to offset reductions elsewhere. A map laid out on this principle was prepared by Messrs. Mandeville and Abbott of the lighting company without leaving their desks.

Encourage the Men—Buy Your Bond

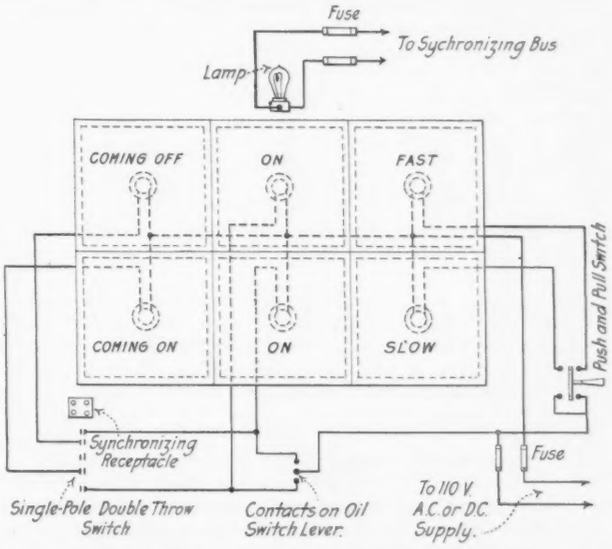
SIGNALING ARRANGEMENT FOR ENGINE-ROOM USE

Box with Six Signal Compartments and Provisions That Compel Switchboard Operator to Signal Engineer Before Synchronizing

BY WILLIAM R. DAVIS

In power plants where the generators are some distance from the switchboard a reliable system of signals between the engineer and the switchboard operator is necessary. The following is a description of a system which the writer has installed in connection with a 1500-kw. unit. A box 18 in. by 10 in. by 6 in. (46 cm. by 25 cm. by 16 cm.), made of transite, was divided into six compartments, in each of which was mounted an 8-cp. lamp. The signals were painted on tracing cloth just large enough to cover the front of the box. This box was mounted on the top of the gage board, where it could be plainly seen by the man at the engine throttle.

Two contacts connected to the signals "On" and "Off" were mounted on the generator oil switch. A pull and push switch, normally open, was mounted on the generator panel and connected to the signals "Slow" and "Fast." Just below the synchronizing plug receptacle was mounted a single-pole, double-throw knife switch, the handle of which in the up position will prevent the plug from being inserted. This switch was connected to the signals "Coming On" and "Coming Off" so that in throwing down the switch the engineer is notified that the operator is ready to synchronize. The switch is



WIRING ARRANGEMENTS FOR ENGINE-ROOM SIGNAL

mounted in such a manner as to compel the switchboard operator to notify the engineer before he synchronizes. A lamp is also mounted on top of the signal box and connected to the synchronizing bus, which permits the engineer to bring the engine to the proper speed by watching the pulsation of the lamp.

CENTRAL STATION SERVICE

A Department Devoted to Commercial Policy and Management Topics, Including Applications of Electric Light, Power and Heat

PRESENT-DAY PROBLEM OF TAKING NEW BUSINESS

Ohio Commercial Managers Discuss Charges for Line Extension and Rates, Especially with Respect to Depreciation of Plant Cost

With underlying conditions to-day so abnormal, with customers seeking service where formerly their patronage was sought, new problems are presented, problems the solution of which affects the business of the years to come just as vitally as it affects the business of to-day.

At the recent meeting of the commercial men of the Ohio Electric Light Association George E. Miller, sales manager of the Cleveland Electric Illuminating Company, read a paper entitled "What Are You Doing About New Business?"

After showing how business has increased, particularly the power load, the difficulty involved in making extensions on account of labor and long deliveries of material, and the condition of the security market, with the very high cost of construction, Mr. Miller discussed the problem of new business from two angles—first, that relating to the extension of residential business, and second, that relating to the extension of commercial business—saying:

In residential business we should not lose sight of the fact that any new policy, such as an increase of rates, is serious. It is serious because rates on residential business affect so large a number of people. Moreover, there will always be among people those who feel that the central station company is taking advantage of them in their helplessness. Because any change in policy affecting residential business does affect so large a number, it is further dangerous, because it is apt to be taken up by local newspapers which find their sustenance in exploiting views that appeal to great numbers of people. Since any change of policy in residential business does affect so large a number and might react upon the company, is it not then the wiser policy to hold residential rates at their present level and to ask the customers to finance extensions for such service in whole or in part?

The plan which we have adopted in Cleveland to cover this case is as follows: The company will stand $25 toward the cost of any extension and will ask the customer to advance the balance of the cost of extension. Then as additional residential business comes on the line the company refunds $25 to the original customer for each additional house added to the extension. While it is realized that this plan is empirical and not ideal, the company is using it.

On the commercial business the situation is somewhat different, and on business requiring additional investment I think there should be two classifications—first, war business, which is primarily a temporary business, and, second, non-war business. I believe these two classes of manufacturers should be treated differently by the central stations, but as yet our company has not reached a solution of the problem. Personally I should like to say to the manufacturers engaged in war business something like this: You have made your deal with one of the foreign governments who financed your manufacturing operations. Why should you not finance the line extension so that we can supply the power? The difficulty comes, however, in finding the dividing line between war business and non-war business, since many concerns employed in apparently peaceful pursuits are vitally aiding the Allies. Nevertheless, some solution for this problem should be worked out, and worked out quickly, or otherwise central stations will find themselves in an even more difficult situation.

The public utilities law in Ohio provides that a valuation for rate-making purposes must be made on the basis of reproduction new at the time the rate making is in progress. Under these conditions a company which puts $6,000,000 into its property during 1917 and 1918 may be in 1919 confronted by some politician stirring up a rate case. Readjustment of prices by that time may have reduced the then value of the property represented by that $6,000,000 to as little as $4,000,000, which was its value three years ago. In that case the question arises as to what will become of the extra $2,000,000 of actual money which was put into the property.

We in Cleveland have not the solution of that problem. One solution might be to increase the commercial rates to take care of increases in capital expenditure—to set aside a fund to take care of this extraordinary depreciation. But the expected decrease in prices may not come. Then the question arises, has the central station any right to charge increased commercial rates and accumulate a fund to write off something which it may never write off? Moreover, this policy, if it is adopted, must have the approval of the public service commission.

I wish to emphasize, however, that some move toward

POLE AND WIRE LINE EXTENSION AGREEMENT

Agreement made this — day of June, 1917, by and between the ———, hereinafter called "company," and ———, hereinafter called "consumer."

SECTION 1.

(a) The company agrees to extend its pole and wire lines from the northwest corner of lot number 10,740 north to a point at the northwest corner of lot number 10,764 and east and west from this point to lots numbers 10,757 and 10,766.

(b) To do the work at a cost of two hundred dollars and eighteen cents.

(c) To refund, without interest, to the consumer fifteen dollars for each additional bona fide consumer connected off of said pole and wire line extension within a period of five years.

SECTION 2.

(a) The consumer agrees to pay the amount specified in Section 1

(b) And deposit said sum with the company upon the signing of this agreement and before said work is commenced.

SECTION 3.

It is mutually agreed:

(a) That so much of the sum specified in Section 1 (b) as shall not have been returned to the consumer within a period of five years shall not be subject to refund but shall be retained by the company as part consideration thereof.

(b) That in no case shall the amount of refund by the company exceed the amount paid by the consumer under this agreement.

(c) That this agreement covers said extension and that no additional poles are included, and that refund will be made according to Section 1 (c) on customers that are within one hundred feet of said line.

(d) Customer's deposit shall not at the end of any one year be greater than an amount which is the difference between the gross revenue paid by all consumers within the limits of said line and the original amount of said two hundred dollars and eighteen cents deposit.

The settlements are to be made at the request of the consumer at the end of one year, and final settlement is to be made within the five-year period.

In witness whereof the parties hereto have, by their duly authorized agents, executed this contract in duplicate this — day of June, 1917.

the solution of this difficulty should be made and made quickly. Quite frequently nowadays the War Department is asking central station companies to make extensions, and these must be made. It is the government's policy not to object to any of the rules and regulations which any operating company may have on file with the commission, so it seems to me that it is the plain duty of every public service company to perfect a plan which will protect its capital investment made under the present conditions.

Following Mr. Miller's address, J. B. Johnson of Elyria stated that his company had been paying $20 toward each residential extension, and expressed the belief that the average residential customer is not worth a twenty-five-dollar extension investment.

A representative of an Ohio operating company read the agreement on the opposite page, pointing out that the customer might be able to get his money back either through the addition of sufficient new customers to the line or through the use of enough energy to justify the extension. A representative of another company in southeastern Ohio stated that his company was endeavoring to close a contract which would involve an expenditure of $250,000 and was asking the company to guarantee a 25 per cent load factor. The contract is to run for a term of ten years. He also cited incidents wherein manufacturers were very glad to bear a part of the line-extension expense. Another company is asking its prospective customers to buy its bonds in an amount equal to the extension required to serve them. In one instance this company is furnishing a town with material to build a line to serve itself. The town will pay for the material and at a later date will rebill the company for the material and labor in the line.

Get on the Band Wagon—Buy a Bond

SCHEME TO PROVE STEAM HEATING UNPROFITABLE

Strategic Move by a Lighting Company Which Plans to Rid Itself of a Franchise That Is Proving Burdensome

A central station company in the Middle West which has been operating a combination electric light and power and steam-heating station has recently gone about getting rid of the steam-heating end of the business in a rather interesting manner. Owing to the company's growing load and to some new territory which it had recently connected by transmission lines the location of the old plant became not the most economical one possible on the system. The company accordingly built a new station in the same city, but at another location. Contrary to what would supposedly be best practice, it divided its generating station instead of working toward consolidation. In the new plant there are boilers, engines and equipment for furnishing electric light and power, while in the old station sufficient boilers were left merely for furnishing steam heat.

This division makes it possible for the company to make an exact showing on just what the steam-heating plant is doing. The rates are ridiculously low, and it undoubtedly will show on the company's books as incurring a deficit. The franchise under which this plant is operating expires in about four years. Between this time and the expiration of the franchise the company can conduct a sufficiently effective publicity campaign to acquaint the steam-heat customers with the fact that the plant is not a paying proposition at the existing rates and cannot be made to pay without entirely rehabilitating the system at an extraordinary expense. At the end of the franchise it will probably be possible to get rid of the plant without creating unfavorable comment.

The Call for Liberty—Buy a Bond

MAKING A PAID SALESMAN OUT OF EVERY EMPLOYEE

St. Louis Company Pays the Members of Its Organization Outside of the Commercial Department a Commission for Successful Leads

For some time past the Union Electric Light & Power Company of St. Louis has been endeavoring to enlist the aid of every employee of the company in securing new customers. At first the plan was to acknowledge the receipt of leads by publishing the names of those who contributed them in the company's magazine, *Wire and Pipe*. The publication of names arranged by departments created friendly rivalry which made the plan quite successful. During the first four months of 1917 the company received 347 leads from its employees, and from these leads it closed 250 contracts.

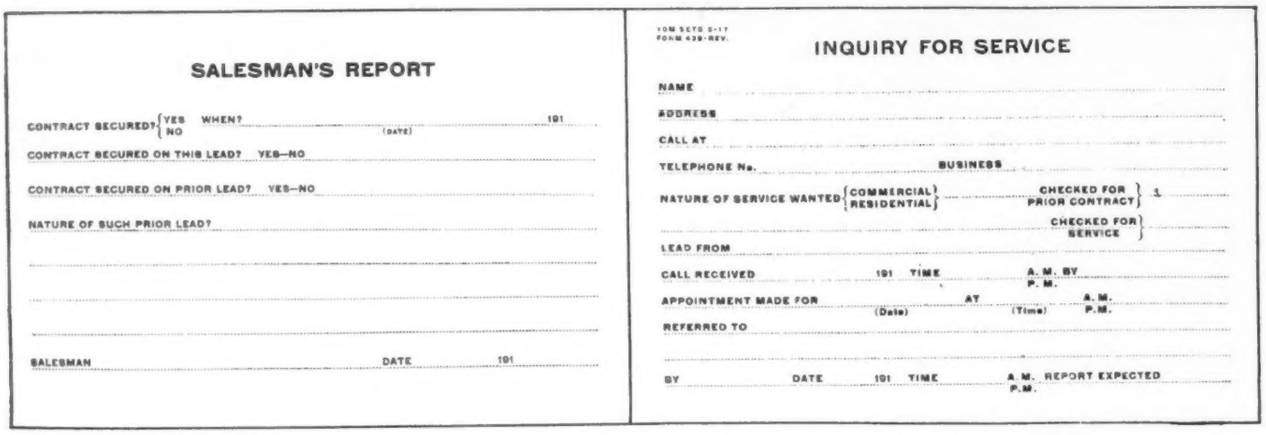
At that time, however, the plan was changed so that the sales department now pays employees and other departments of the company for their personal efforts on the following basis: 25 cents for each residential lead, 35 cents for each commercial lead and 50 cents for each industrial lead, provided in every case that a contract is obtained.

This commission is not paid if a prior lead has been received, and it is not paid for leads received by office employees during the regular course of business. The sales department furnishes each department head with a supply of the forms shown herewith. Employees are requested to report leads on these forms, filling out the prospective customer's name and address and information regarding an appointment, if a definite appointment has been made. The form is filled out in triplicate, the original and the duplicate being sent to the chief clerk of the sales department as promptly as possible, and the triplicate copy being kept for the record of the person sending in the lead. If it is more convenient, it is possible for an employee to telephone the sales department. Provision has been made for taking care of such tips.

During the second four months of this year, May to August inclusive, F. D. Beardslee, sales manager of the company, states, 810 leads under the new plan were obtained from employees and 533 contracts were sold. These results indicate that the cash incentive increased the number of leads received in the ratio of 1 to 2.4 and increased the ratio of contracts obtained in the ratio of 1 to 2.13. From this it is evident that the offer of money not only broadened interest in the plan but also made non-commercial employees search more diligently for business.

It is interesting to note the excellent type of leads secured. In July, for instance, the leads from employees were 137 in number, of which 91 resulted in contracts, or 66.4 per cent. Fifty-eight employees, representing

sixteen departments in all, sent in these leads. As a rule, of course, the number of leads per employee per month is in the neighborhood of two or three, but in this month of July one man in the collecting department sent in eleven leads, ten of which resulted in contracts, and one man in the installation department reported twelve prospects, with a result of eight contracts obtained. It is interesting further to observe the interest in the plan that has been taken by the more technical departments of the company.



SALESMAN'S REPORT

CONTRACT SECURED? {YES / NO} WHEN? ..... (DATE) 191

CONTRACT SECURED ON THIS LEAD? YES—NO

CONTRACT SECURED ON PRIOR LEAD? YES—NO

NATURE OF SUCH PRIOR LEAD?

SALESMAN ..... DATE 191

10M SCTS 5-17
FORM 439-REV.

INQUIRY FOR SERVICE

NAME .....

ADDRESS .....

CALL AT .....

TELEPHONE No. ..... BUSINESS .....

NATURE OF SERVICE WANTED {COMMERCIAL / RESIDENTIAL} CHECKED FOR {PRIOR CONTRACT / SERVICE}

LEAD FROM .....

CALL RECEIVED 191 TIME A. M. / P. M. BY .....

APPOINTMENT MADE FOR (Date) AT (Time) A. M. / P. M.

REFERRED TO .....

BY ..... DATE 191 TIME A. M. / P. M. REPORT EXPECTED .....

FRONT AND BACK OF CARD USED BY EMPLOYEES OF ST. LOUIS COMPANY ACTING AS SALESMEN

A PLAN FOR INFORMING CUSTOMERS OF METER TESTS

It Has Been Found in Small Eastern Town to Allay Suspicion and to Reduce Number of Complaints

A simple and inexpensive plan for keeping the customer posted on the test condition of his service meter has been put in practice in Salem, N. Y., a town of 1300 people, by the Salem Light, Heat & Power Company, which has had exceptionally good customer-relations results.

It has been the policy of this company, W. H. Simpson, the superintendent, writes, as soon as a complaint is entered just to check up the bill and then to test the meter. Frequently the meter is tested when the bill is known to be correct, so that the customer can know the result.

SALEM LIGHT, HEAT and POWER CO.

Salem, N. Y., ...19....

M... .....:-

We have this day tested Meter No. .....

through which we serve you.

The Meter registers.....% at.....load.

Kindly place on file for your reference.

S. L. H. & P. Co.,

..... Sup't.

POST-CARD NOTIFICATION TO CUSTOMERS

As soon as the test is completed and the results checked over, a post card such as the one shown is mailed to the customer. Since this plan was started the company has received fewer complaints and its customers appear to be better satisfied.

Quite a few of these post cards have been noticed tacked on the wall near the meter, which the company feels is an indication of approval of its plan of furnishing a permament record of the condition of the meter at a stated time.

Hit the Line Hard—Get That Bond

COMMONWEALTH EDISON OPENS BARGAIN ROOM

Shopworn Goods Formerly Sold at Employees' Sales Are Now Disposed of to Public Also at 33 1/3 per Cent Discount

The Commonwealth Edison Company of Chicago formerly disposed of goods which became shopworn in its electric stores by occasionally conducting an employees' sale. With the increasing stock and the larger volume of merchandising business which the company now does, it seems that there will be enough of this sort of merchandise to keep the sale going at all times. Therefore a new bargain salesroom, adjoining the company's electric shop at 72 West Adams Street, has been opened.

The management of the company is unwilling that any customer of its electric shops should have an opportunity to claim that the goods purchased were not absolutely new. Consequently something must be done with the lamp shade which has acquired a finger mark or a little dust on the trimmings, though this does not really hurt its value except under the most critical inspection. An article having a highly polished nickel or copper finish will become dull and will not look right until it is rubbed up as these things constantly are in the home. A lamp shade which has a scratch or a slight nick inflicted by somebody's umbrella—things like these are taken off the main salesroom floor and become a part of the stock in the new bargain salesroom. This salesroom will be open to the general public as well as to employees. The discount from the retail prices originally asked for the articles will be 33 1/3 per cent for everybody without further discount to employees. This new bargain salesroom, it is believed, will enable a great many people to get really first-class electrical goods in almost perfect condition.

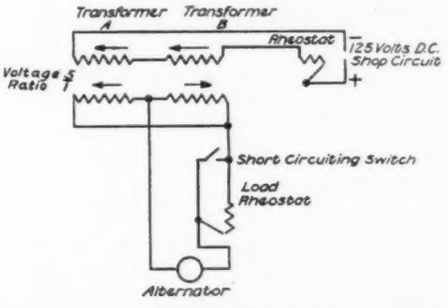
ADVANCE IN TECHNICAL THEORY AND PRACTICE

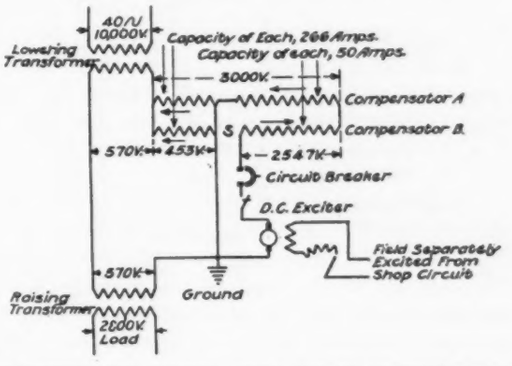
Including a Digest of Important Articles Appearing in the Scientific and Engineering Press of the World

D.-C.-EXCITED TRANSFORMERS AS CURRENT-LIMITING REACTORS

Two Auto-Transformers Connected with Half of Each Winding in Multiple for A.-C. Circuit, Other Windings in Series for D.-C. Excitation

TO PREVENT frequent interruption of the entire source of energy available in the testing department of the General Electric Company, auto-transformers were connected as shown in Fig. 2 so that half of each winding could be excited by direct current. In this way the iron cores were initially saturated with





FIGS. 1 AND 2—CIRCUIT EXPERIMENTED WITH, AND METHOD OF PROTECTING CIRCUIT WITH DIRECT-CURRENT-EXCITED TRANSFORMERS

transformers connected as shown in Fig. 1. The most convenient source of power at the time was a small 8-kw. alternator, giving 250 volts at 125 cycles, although one test was made at 40 cycles. The data used in plotting the curves in Fig. 5 were obtained with a short-circuited load and with the secondary coils of the two transformers in multiple to act as a reactor connected directly across the alternators while the voltage was held constant.

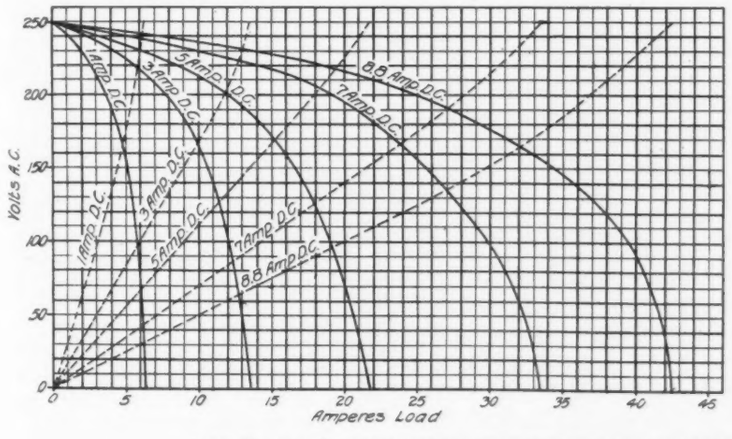
For the curve in Fig. 3 the alternator voltage and direct-current excitation were held constant, the former at 250 volts and 125 cycles, while the load was varied.

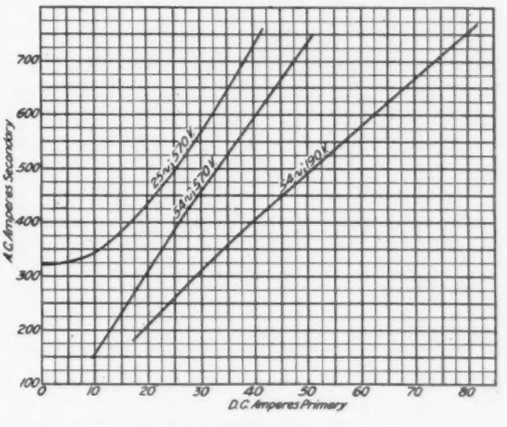
a unidirectionally magnetic flux of opposite polarity in each with respect to the alternating emf. in the secondary coils.

Before setting up the large compensator, which was formerly used on single-phase interurban railway cars for reducing the voltage from 3000 to 453, a preliminary test was made with a pair of 10-kw. lighting

Curves were plotted for the voltage across the load as well as across the reactor. These curves are probably not very representative of what might be shown by tests at a lower frequency. The dotted set of curves show an upward curvature which would indicate a better regulation of the circuit under normal operations for a given current limit on short circuits than with a coil of uniform reactance at all loads such as an air-core reactor.

Next, the outfit selected to protect the testing service



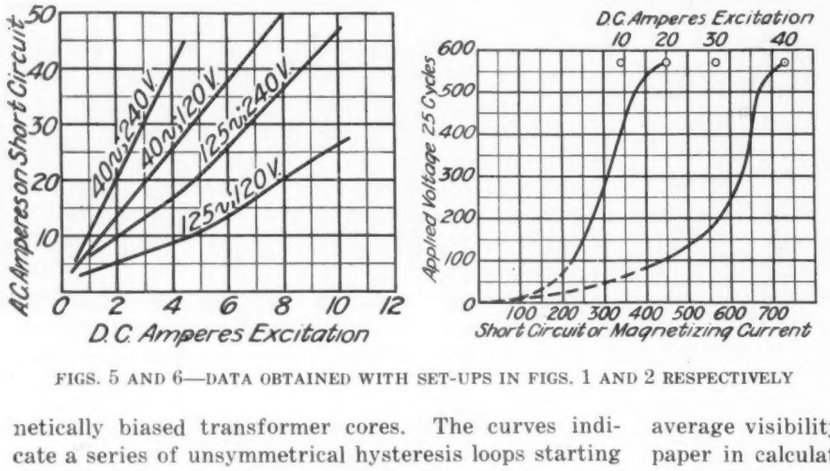


FIGS. 3 AND 4—DATA OBTAINED WITH SET-UPS INDICATED IN FIGS. 1 AND 2 RESPECTIVELY

*This method of connecting transformers for use as current-limiting reactors has been described by John D Taylor in a paper entitled "Even Harmonics in Alternating-Current Circuits," *Trans. A. I. E. E.*, Vol. XXVIII, Part 1, 1909, page 729.

was tested with current from the load side before being connected with the power line, tests similar to those made with the smaller transformers being conducted on short circuit. The data for these tests are shown in Figs. 4 and 6.

The curves in Fig. 7 afford an opportunity of studying what performance might be anticipated with magnetically biased transformer cores. The curves indicate a series of unsymmetrical hysteresis loops starting at different flux along the magnetic saturation curve of silicon steel and dropping through an amplitude of 4000 lines per square centimeter in each case, then returning to the starting point. In each the steel is more and more magnetically biased as the centers of successive loops get further away from the intersection of the neutral axes. In the reactor with a direct-current component of ampere turns giving magnetically biased cores the alternating magnetizing will vary over the range of H at a rapidly increasing rate in the case of each of the successive loops when constant alternating voltage is impressed across the winding B and the direct-current excitation H is varied. In other words,


A.C. Amperes on Short Circuit
D.C. Amperes Excitation
40 v. i. 240 V.
40 v. i. 120 V.
125 v. i. 240 V.
125 v. i. 120 V.
Applied Voltage 25 Cycles
Short Circuit or Magnetizing Current

FIGS. 5 AND 6—DATA OBTAINED WITH SET-UPS IN FIGS. 1 AND 2 RESPECTIVELY

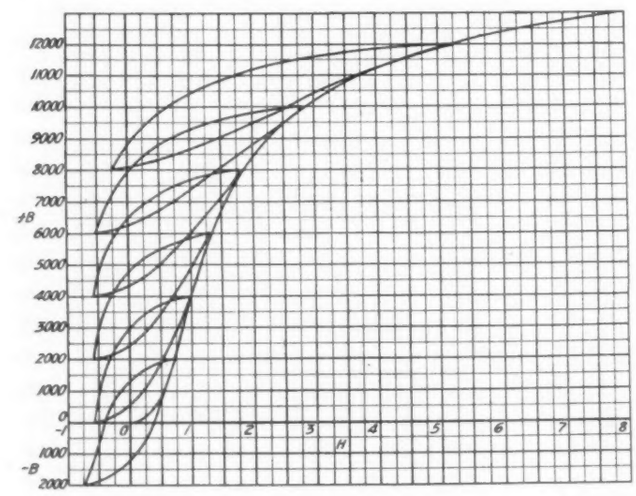


FIG. 7—GROUP OF UNSYMMETRICAL HYSTERESIS CURVES, INDICATING THAT MORE ALTERNATING CURRENT CAN FLOW THE GREATER THE MAGNETIC BIAS OF THE DIRECT-CURRENT-EXCITED TRANSFORMER

as the direct-current ampere-turns are increased, the reactance is reduced, because more alternating current must flow to overpower the direct-current magnetization before it can induce the same counter emf. This information was presented by F. Parkman Coffin in the October, 1917, issue of the *General Electric Review*.

Lamps and Lighting

Relative Sensibility of the Average Eye to Light of Different Colors.—Data on the spectral sensibility of radiation of the average eye, as based upon a group of 130 observers, of which number seven were known to be color-blind. The relative-visibility curves were determined with a flicker photometer and an equality-of-brightness photometer. The data available indicate that 60 per cent of the cases examined fall into three quite evenly divided groups which are either (1) red-sensitive, (2) blue-sensitive, or (3) average; while 30 per cent of the cases examined are quite evenly divided into three groups which fall below the average sensibility in either (1) the red, (2) the blue, or (3) both the red and the blue, thus giving rise to an apparently high sensibility in the green. A mathematical equation is given of the average visibility curve, which is applied in a separate paper in calculating the luminous energy emitted by a black body at various temperatures; also the luminous efficiency, the Grova wave length, and the mechanical equivalent of light. The value of the latter is about 50 candles per watt of luminous energy of maximum visibility.—*Scientific Paper No.* 303, Bureau of Standards.

Generation, Transmission and Distribution

Electricity Supply Costs.—FRANK H. WHYSALL.—The author discusses factors which must be considered in selecting a site for a station and also the effect of the size of the undertaking on the cost of supply. Special consideration is given to the use of exhaust steam for industrial purposes.—London *Electrician*, July 27, 1917 (abstracted from *Channel*).

Relative Cost of Producing Electric Energy and of Purchasing It.—G. P. ROUX.—An inquiry into the principles that should underlie the decision of industrial consumers as regards generating energy or buying it from the central station. The common method in estimating cost of production is to include exploitation, maintenance and fixed charges, the latter covering interest, insurance, taxes, amortization and depreciation. Other factors are often ignored, as, for example, rent, probable increase of taxes, and the productive capacity of the capital invested in electrical equipment as compared with what it would bring if employed in the regular work of the factory. Besides these there are factors of less importance. The author groups under "cost of production" coal, ash disposal, water treatment, lubricants, wages and accident insurance, professional services, and expense for repairs and upkeep. Under "fixed charges" he lists a number of items that enter into the initial outlay but are usually overlooked when estimating total interest charges. Among these are counsel fees, expense of preliminary studies and experiments, charges for transportation, storage and watchmen, payment for lost time by workmen, insurance and interest on capital during the construction period, and the outlay in the final period of experiment and verification before the equipment is ready for operation. Such items sometimes make up 10 per cent of the cost of installa-

tion. Against amortization charges, on the other hand, there should be set the scrap value of some parts of the equipment, old copper, for instance, being worth 60 per cent of its original price. The cost of reserve generating equipment should never be lost sight of. Continuity of service cannot be assured without it. None the less, the author has never known it to be taken into consideration, as it should be, in estimating the net cost of power. Then there is the loss, already alluded to, of the difference between an arbitrary return of, say, 6 per cent on the capital tied up in the electrical installation and the presumably much higher rate of profit from funds invested in the business proper. The necessity of keeping on hand a considerable amount of ready money to meet current expenses of the plant is a further consideration. Similar calculations to the above should be made by the central station companies themselves in framing their tariffs. This task of computation belongs to the specialist, the engineer, who could often save the consumer of electrical energy important sums.—*Revue Gén. de l'Elec.*, Sept. 1, 1917.

Installations, Systems and Appliances

Electric Resistance Furnace.—FRANK THORNTON.—Description of experiments on an electric resistance furnace with various resistors placed inside the furnace, either on the hearth of the furnace or on a shelf around the walls. The furnace was designed for heating steel commercially to forging temperatures. It was pointed out that such a furnace would have many other applications, such as heat treating, melting, firing ceramics, etc. Many difficulties were encountered in using granular resistor beds, and it was decided to try silica carbide blocks or slabs for the resistance material. The results were satisfactory and the furnace was operated successfully up to 1200 deg. C. for hardening tools and dies and for firing porcelain.—*Met. and Chem. Eng'g*, Oct. 15, 1917, report of meeting of A. E. S.

Electrophysics and Magnetism

Relation Between Tension and Magnetic Permeability.—JAMES THERON ROOD.—Cast iron is unaffected in its magnetic properties by stresses, whereas wrought iron and steel are greatly affected in their magnetic properties by extensional stresses. This effect, however, is not a constant but varies in both sign and magnitude, according to amount of stress and to degree of saturation. Below the knee of the *B-H* curve permeability of wrought iron and steel is increased by all stresses below a certain maximum, this maximum varying with the material. This increase may be as high as 20 per cent. For stresses beyond this maximum the permeability is decreased up to the elastic limit of the material. This decrease may reach 15 per cent. Above the knee of the *B-H* curve permeability of wrought iron and steel is decreased by any extensional stress. This decrease may reach a value of 8 per cent or more. Its value diminishes as the degree of saturation increases. With rolled material the effect of tension on magnetic properties increases as the elasticity decreases. Cast iron is an exception. Considered from standpoint of the free and combined carbon present in the material, the results of the tests made fall naturally into the ascending scale of cast iron, steel, wrought iron. The carbon molecules or particles may act as filler or cement, thus preventing the free action of the pure iron molecules. If it is assumed that the effect of tension is, first, to twist the molecules so as to bring their axes toward parallelism with the direction of the stress; second, to tend to separate the molecules, the reversal effect at low stresses can be accounted for.—From paper read before American Association for the Advancement of Science, Dec. 29, 1916.

Units, Measurements and Instruments

Electric-Current Measuring Instruments with Parabolic Law of Deflection.—J. K. A. WERTHEIM SALOMONSON.—Made by mechanically coupling the moving parts of two instruments, in one of which the deflection is proportional to the current and in the other proportional to the square of the current, so that they oppose each other. A discussion is presented regarding the relative or absolute sensibility of such an instrument and suggestions are given as to its use.—London *Electrician*, Sept. 7, 1917 (abstract of paper in *Proceedings* of Koninklijke Akademie van Wetenschappen).

Miscellaneous

Transfer of Heat Between a Flowing Gas and a Containing Flue.—LAWFORD H. FRY.—The author offers a formula which within a wide range of conditions will represent with all the accuracy needed for practical work the processes of heat transfer between a gas and a metallic flue wall. The formula applies equally well to the loss of heat by a hot gas in a cooler flue and to the gain of heat by a cool gas in a hotter flue, and although it has been established by purely empiric methods, yet the accuracy with which it conforms to the results obtained by various observers using widely differing experimental methods leads to the belief that it represents closely the fundamental law by which heat is transferred under the conditions under consideration. The wide range of the experimental data on which the formula is based may be summarized briefly as follows: The gases experimented with were products of combustion, lighting gas, CO_2 and air, all at atmospheric pressure; also air at pressures ranging from 0.15 lb. to 140 lb. per square inch absolute. The rates of flow ranged from 0.5 lb. to 650 lb. per hour. Flues of annular and circular cross-section were used, with effective diameters ranging from 0.5 in. to 2 in. and of lengths from 0.64 ft. to 20 ft. The inlet gas temperatures ranged from 2340 deg. Fahr. with the products of combustion being cooled to 55 deg. Fahr. with air being warmed. In all of the experiments throughout this wide range of conditions the transfer of heat is satisfactorily represented by the general formula: $\text{loglog } T_1/t - \text{loglog } T_2/t = Mx$, and if the flue temperature be higher than the gas temperature, $\text{loglog } t/T_1 - \text{loglog } t/T_2 = Mx$, where M is a constant in any given case, being dependent only on W, the rate of flow of the gas, and on $d/4$, the hydraulic depth of the flue. In the experiments under consideration there is a critical rate of flow at about 5 lb. of gas per hour. At all rates of flow above this the value of the coefficient M is accurately given by the equations $\log M = A - m \log W$, where $A = 1.558 - 0.185d$, and $m = 0.14 + 0.083d$. Applications of the formula are based on a Babcock & Wilcox experiment in which products of combustion at a high temperature were passed through a water-jacketed flue and the temperature determined at a number of points along the flue.—*Journal of A. S. M. E.*, October, 1917.

Scientific and Industrial Research

A Department Devoted to Interchange of Ideas, Investigations Contemplated, Research Facilities Available, and Suggestions for Co-operative Work.

Conducted by PROF. VLADIMIR KARAPETOFF

Cornell University, Ithaca, N. Y.

A NATIONAL UNIVERSITY FOR PROMOTING RESEARCH

Bill to Create Such an Institution Was Introduced in the Last Two Congresses, and Another One Will Probably Be Presented Soon

A bill to create a national university, one of the purposes of which will be to provide for scientific research, was introduced by Mr. Murray in the last (Sixty-fourth) Congress and was heartily supported by Mr. Fess, of the committee on education, who introduced a similar bill in the Sixty-third Congress. It has been stated on good authority that a similar bill will be introduced as soon as the next regular session convenes in December.

As outlined in the recent bill, the purpose of the national university is fourfold: (1) To provide instruction in foreign trade, diplomatic and consular service and in international law; (2) to promote the advance of pure and applied science and of the liberal and fine arts by original investigation and research; (3) to provide for the higher instruction and training for posts of importance and responsibility in state and federal government; (4) to co-operate with the scientific departments of the federal government and with institutions of higher learning throughout this country and abroad. The university shall confer no academic degrees, but an equivalent of the master's degree from some institution of recognized standing will be required for admission. Supervision of the university shall be in charge of a board of trustees consisting of the Commissioner of Education and twelve members appointed by the President of the United States, the term of one member expiring each year. In addition there shall be an advisory council consisting of one representative from each state. Museums, libraries, bureaus, laboratories and departments of expert research belonging to the federal government shall be as far as possible open to the students. An appropriation of $500,000 is asked for the first year.

In presenting the unanimous report of the committee on education in favor of such a university, Representative Fess pointed out the resourcefulness of the German scholars and scientists, who, by finding substitutes for the supplies cut off by the war, are doing as much as, if not more than, the German soldiers in the war. Already the city of Washington is a research center, and it has model laboratory and library equipment in the various governmental bureaus. Hundreds of experts are available so that research can be easily cared for. The national university proposed will not interfere with existing colleges and universities, but will supplement them. It will divert the flow of American students to Europe and attract Europeans here.

Summary of Investigations, Available Apparatus and Research Suggestions

INVESTIGATIONS UNDER WAY OR COMPLETED (RESEARCH WORK REPORTED SINCE SEPT. 15.)*

ELECTROLYTIC CORROSION.
Investigation of pipe drainage systems to avoid electrolysis.—*Burton McCollum and K. H. Logan, Bureau of Standards, Washington.*

GALVANOMETERS.
Development of new type of vibration galvanometer which shall be sensitive and portable.—*P. G. Agnew, Bureau of Standards, Washington.*

LAMPS, TUNGSTEN.
Candlepower maintenance of series type C tungsten lamps.—*J. F. Meyer and E. C. Crittenden, Bureau of Standards, Washington.*

MAGNETIC TESTS.
Determination of mechanical properties of steels by magnetic analysis.—*C. W. Burrows and R. L. Sanford, Bureau of Standards, Washington.*
Investigation of effect of repeated stress upon magnetic properties of steel.—*C. W. Burrows and R. L. Sanford, Bureau of Standards, Washington.*

PHOTOMETRY.
Measurements for the establishment of a normal eye for heterochromatic photometry.—*E. C. Crittenden and A. H. Taylor, Bureau of Standards, Washington.*
Investigation of diffusely reflecting white paints for use with sphere photometers.—*A. H. Taylor, Bureau of Standards, Washington.*

RADIOACTIVITY.
Study of radioactive luminous preparations; determination of time-luminosity curves, variation of luminosity with quantity of material, etc.—*N. E. Dorsey, Bureau of Standards, Washington.*

RADIO TRANSMISSION.
Development of radio-frequency current transformer.—*R. D. Duncan, Jr., Bureau of Standards, Washington.*

SIGNALING APPARATUS.
Development of fog-signaling apparatus.—*F. A. Kolster, Bureau of Standards, Washington.*

STANDARD CELLS.
Improvements of Weston normal cell. Preparation of mercurous sulphate with definite, uniform and constant properties.—*E. C. McKelvy and M. P. Shoemaker, Bureau of Standards, Washington.*

TELEPHONE LINES.
Investigation of methods for measuring the transmission efficiency and losses in telephone lines.—*F. A. Wolff, Bureau of Standards, Washington.*

X-RAYS.
Investigation of protective materials for X-ray work.—*W. S. Gorton and P. T. Weeks, Bureau of Standards, Washington.*

SUGGESTIONS FOR RESEARCH

CURRENT TRANSFORMERS.
Experimental investigation of electric by-pass valves, vacuum gaps, sphere gaps and other similar devices as a protection of current transformers against traveling waves and surges with steep front.—*Editorial Suggestion.*

FUSE INDICATOR.
On a branch transmission line protected by a fuse, some arrangement to indicate at a distant place, say in a power plant, when the fuse has blown. Either an extra low-tension pilot wire could be allowed or the telephone wires should be used.—*Editorial Suggestion.*

IRON, ELECTROLYTIC.
The electrolytic production of iron on an industrial scale seems to have a bright future, but it is accompanied by a polarization of electrodes. This is probably the only reason for which all iron has not been produced electrolytically for a long time, like copper which is electolytically refined. It is of great interest to find out how this polarization varies with the nature of the electrolyte, its temperature, etc.—*H. Le Chatelier, Paris, France.*

PHASE BALANCING.
Large operating companies are at times called upon to furnish large single-phase loads, such as electric furnaces, which badly unbalance their generating and distributing systems. It is desired to develop inexpensive devices or methods of connections that would remedy the situation at least in part. Revolving phase balancers or motor-generator sets are often too expensive and require attention.—*Editorial Suggestion.*

STORAGE BATTERIES.
Determination of the charging current which will flow when a definite constant potential is applied to a storage cell under various conditions of state of charge, temperature, specific gravity of electrolyte, type of plate, age of plate, etc.—*J. Lester Woodbridge, Electric Storage Battery Company, Philadelphia.*

TRANSFORMER OIL, MAINTENANCE OF.
We have not found that even the latest type transformers can be relied on to prevent the entrance of moisture unless an unusually high degree of skill is exercised when assembling the transformer cover and bushings. There is no difficulty in drying the oil except that the time and expense of drying transformers which are out some distance from the maintenance headquarters is quite large.—*E. P. Peck, Georgia Railway & Power Company, Atlanta, Ga.*

*The names of individuals given after each institution reporting investigations are those of persons with whom others interested should communicate. All institutions reporting research work should give such names.

NEWS OF THE INDUSTRY

Chronicle of Important Events and General Activities in the Technical, Commercial and Manufacturing Fields

SAVING MONEY TO BUY THE LIBERTY LOAN BONDS

Allen B. Forbes Says that Economic Losses from Wars Often Do Not Have the After Effects Anticipated

Every effort is being made by the Liberty bond committee in New York to impress upon the people the necessity of saving to buy bonds. So far as is possible the money must come out of present and future earnings of Americans.

"Intensified production and intensified economy" must be the slogan if America is to win the war and end the German menace. This was emphasized in a statement by Allen B. Forbes of Harris, Forbes & Company, chairman of the distribution committee. Mr. Forbes said:

The economic losses resulting from wars, while staggering in their totals, often do not have the serious after effects on the industrial and financial structure of a nation that it would seem natural to anticipate. This is true because of the fact that the law of compensation still continues to exist even in the midst of the most horrible of all human activities—devastating war.

It is perfectly reasonable to anticipate, for instance, that as a result of the destruction of capital caused by the present European war the world will face during the next decade a world-wide rise in interest rates. This expectation appears logically and economically sound. History has amply proved, however, that such a development does not invariably attend the ending of a war.

The period from 1853 and 1864 was one of almost continuous wars. During this period there occurred the Crimean war, the Italian Liberation war, the Austro-Prussian war and our own civil war. Interest rates were high during this period, but the Bank of England records show that immediately after the end of these wars the interest rate declined sharply and for the next twenty years the open discount rate averaged less than 3 per cent, declining at one time to 1 per cent. In other words, after these wars the discount rate averaged less than during the period before the wars began.

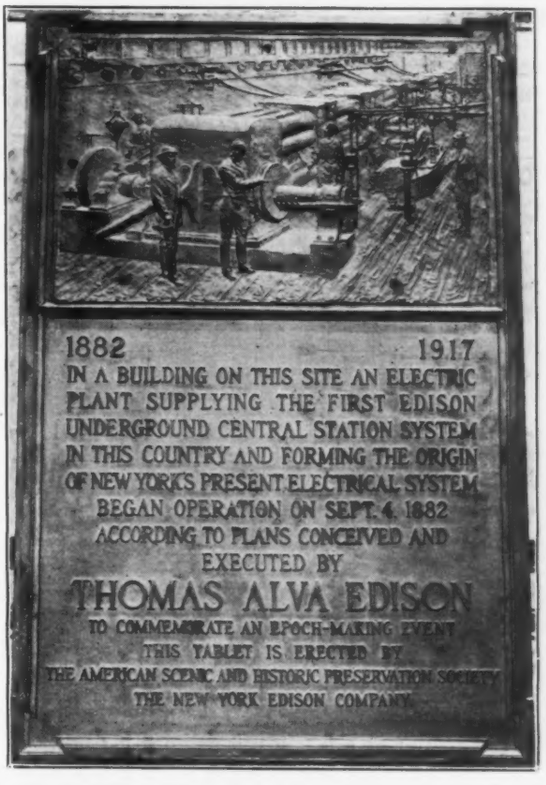
In fact, it appears that the movement of the interest rate of the world during this period was very similar to what occurs during a panic. In the midst of a panic interest rates usually advance, but immediately after the panic there ensues a period of comparatively low interest rates. We all know that the investor who has the foresight and courage to purchase high-grade investment bonds during panic periods not only obtains an investment returning him for many years thereafter an unsually high interest return, but invariably later on has the satisfaction of witnessing a material enhancement in the value of his investment.

Among the compensating advantages resulting from wars which go a long way toward offsetting the economic losses suffered at that time are increased national production and increased national economy. If we are going to carry this war through to a successful conclusion and if we are going to avoid disastrous after effects, we have got to have intensified production and intensified economy. Certainly, no one in this country is exempt from 'doing his bit' in this respect. People who never owned a bond or had a bank account must economize and build up a bank account and become owners of government bonds. This is certainly the least service that our country can ask of any of us.

NEW EDISON TABLET FOR THE PEARL STREET STATION SITE

Exercises Commemorating Thirty-fifth Anniversary of Incandescent Lamp Part of the Electrical Exposition in New York

Exercises commemorating the thirty-fifth anniversary of the introduction of the incandescent lamp in New York and for the dedication of the bronze tablet which is to be placed on the site of the original generating station operated by Edison at 257 Pearl Street, in that city, were held at the Grand Central Palace on Thursday of this week in connection with the annual Electrical Exposition.


1882 1917
IN A BUILDING ON THIS SITE AN ELECTRIC PLANT SUPPLYING THE FIRST EDISON UNDERGROUND CENTRAL STATION SYSTEM IN THIS COUNTRY AND FORMING THE ORIGIN OF NEW YORK'S PRESENT ELECTRICAL SYSTEM BEGAN OPERATION ON SEPT. 4, 1882 ACCORDING TO PLANS CONCEIVED AND EXECUTED BY
THOMAS ALVA EDISON
TO COMMEMORATE AN EPOCH-MAKING EVENT THIS TABLET IS ERECTED BY THE AMERICAN SCENIC AND HISTORIC PRESERVATION SOCIETY THE NEW YORK EDISON COMPANY

BRONZE TABLET WHICH WILL MARK SITE OF FIRST EDISON ELECTRIC POWER HOUSE IN NEW YORK

Thomas Alva Edison was invited to be present, as were also the men who were with him during the construction of the original station.

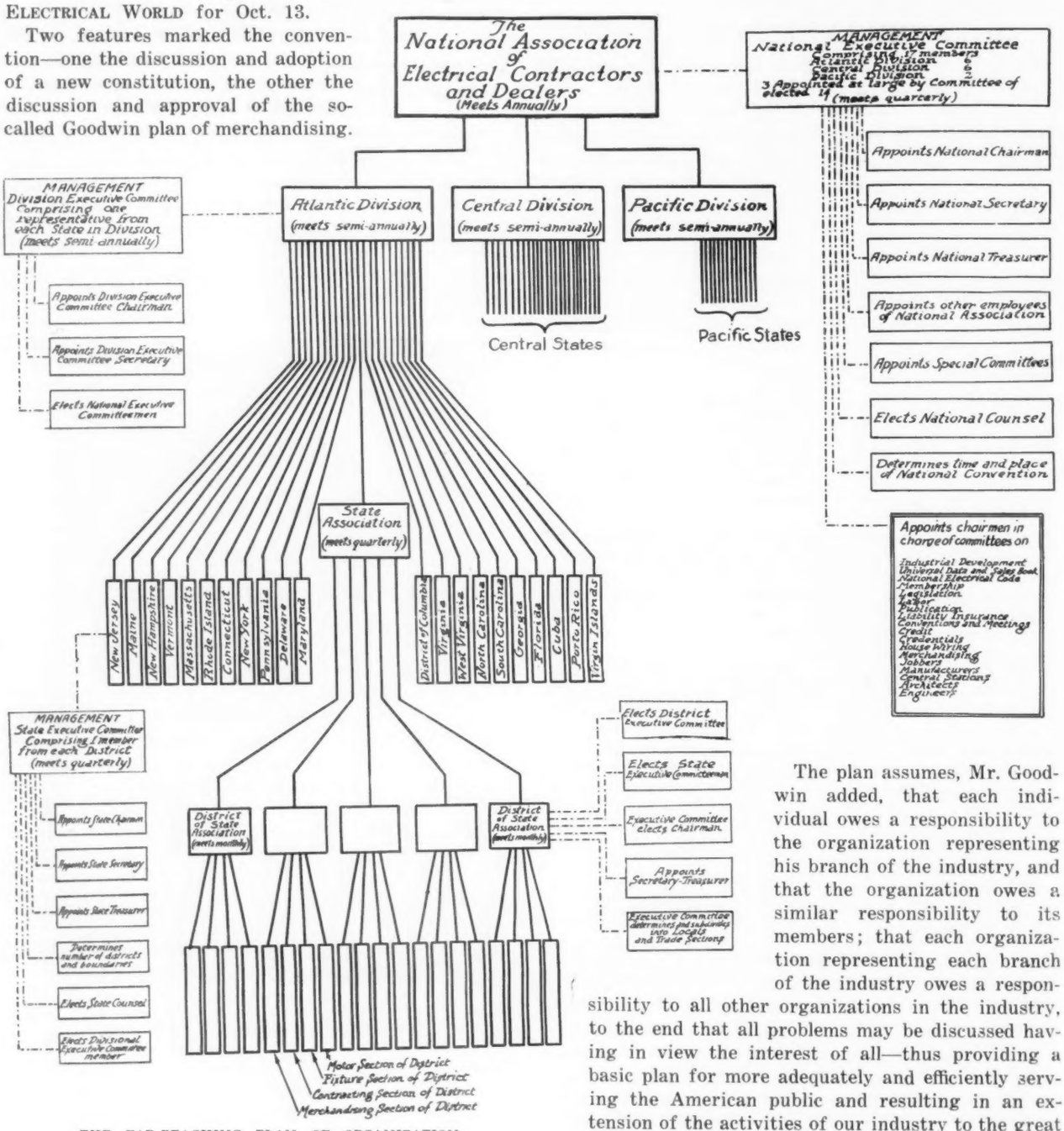
Borough President Marks accepted the invitation of the American Scenic and Historic Preservation Society to make an address. Other speakers on the program were Dr. George F. Kunz, the president, and J. W. Lieb, president National Electric Light Association. Arthur Williams, general commercial manager New York Edison Company and president of the Electrical Exposition, presided.

CONTRACTORS ORGANIZE TRADE RELATIONS TO THE INDUSTRY

New Constitution Adopted and Constructive Program to Better Trade Relations of Industry Agreed Upon

An epoch-making convention of the National Electrical Contractors' Association was held on Oct. 8 to 13 at New Orleans. The general program and part of the sessions were reported in the ELECTRICAL WORLD for Oct. 13.

Two features marked the convention—one the discussion and adoption of a new constitution, the other the discussion and approval of the so-called Goodwin plan of merchandising.



THE FAR-REACHING PLAN OF ORGANIZATION

William L. Goodwin presented a paper entitled "The Ills of the Industry and Their Remedies Through the Proposed National Association of Electrical Contractors and Dealers." A condensed report of his talk follows:

The Goodwin plan, said Mr. Goodwin, involves a campaign of education, now under way, conducted principally through trade papers, trade organizations and other channels, to co-ordinate the various interests in the electrical industry.

Or, to put it another way, the plan seeks to bring together in harmonious action the various interests in the industry, so that there may be established the retail distribution of electrical materials, at fair prices to the consumer and with a fair profit to all parties taking part in the transaction.

The plan assumes, Mr. Goodwin added, that each individual owes a responsibility to the organization representing his branch of the industry, and that the organization owes a similar responsibility to its members; that each organization representing each branch of the industry owes a responsibility to all other organizations in the industry, to the end that all problems may be discussed having in view the interest of all—thus providing a basic plan for more adequately and efficiently serving the American public and resulting in an extension of the activities of our industry to the great undeveloped field before us.

In outlining his plan at length Mr. Goodwin expressed the belief that it will be necessary for the national contractors' organization to develop an income of at least $250,000 per year to deal properly with the problem before the contractor-dealer. He added:

"In order to do that, for your own self-interest, you must have the financial support of every contractor-

dealer in the industry, so far as it may be possible for you to enlist their support. You need that money to provide the staff, and the staff is necessary to carry out the plan which I have proposed. The present officers of the national association are handicapped from lack of finances to accomplish the results desired."

The chart reproduced here indicates the sweeping changes in the constitution. Local associations form the working units governed by state and national associations and boards by delegates from the locals. The constitution also provides for members such as drug stores, hardware and department stores which are doing a retail electrical business. The constitution was adopted unanimously.

President R. S. Stearnes and the other officers and committees of the association will continue in office until the new executive committee is formed under the new constitution. This executive committee will then appoint its own and the national chairman and other officers for the year.

Meanwhile special state committee chairmen on permanent organization have been appointed as follows, under the three division chairmen—James R. Strong, New York, for the Atlantic Division; Earnest McCleary, Detroit, for the Central Division, and H. C. Reid, San Francisco, for the Pacific Division:

Alabama	J. R. Wilcox	Minnesota	W. I. Gray
Arkansas	C. G. Rush	Missouri	Fred Adam
California	W. D. Kahlwey	Nebraska	James Corr
Connecticut	G. M. Chapman	New Jersey	Paul H. Jaehnig
Georgia	T. H. McKinney	New York	J. J. O'Leary
Illinois	J. N. Pierce	Ohio	F. C. Werk
Indiana	A. L. Swanson	Oregon	J. R. Tomlinson
Iowa	J. E. Sweeney	Pennsylvania	Albert Gentel
Kansas	R. M. Sutton	Tennessee	J. A. Fowler
Kentucky	C. C. Childers	Texas	W. M. Clower
Louisiana	C. Sam Barnes	Virginia	E. G. Andrews
Massachusetts	A. J. Hixon	Wisconsin	George F. Rohn
Michigan	J. J. Thorne	Washington	J. NePaige

Do It Cheerfully—Lend for Liberty

BUSINESS CONDITIONS WITH THE LAMP MANUFACTURERS

Independent Incandescent Lamp Manufacturers Fear Another Serious Shortage of Supply During the Coming Winter

A dinner was given on the evening of Oct. 4 at the Hotel McAlpin, New York, by A. W. Wiest, president of the American Appliance Company of Indianapolis, to commemorate the purchase of the Metalyte Company of New York, manufacturer of incandescent lamps. Twenty-five representatives of independent manufacturers of incandescent lamps attended the dinner, and the outlook for the manufacture and sale of lamps during the coming winter was discussed at length.

The opinion was expressed that the shortage of lamps in the coming months would be as great as, or greater than, it was during the last winter. Demand is still running far ahead of production. Many of the manufacturers said that they are unable to provide for new customers, so heavy is the demand from old customers. They do not feel alarmed at present in regard to the supply of raw material, but the scarcity of labor is being felt by lamp manufacturers as well as in other branches of the industry.

WAR NEEDS OF THE PUBLIC AND THE PUBLIC UTILITIES

At Convention of State Commissioners in Washington This Week President Thelen of California Body Discusses Vital Issues

In his address as president of the National Association of Railway Commissioners at Washington this week Max Thelen gave special attention to matters affecting electric utilities. Mr. Thelen, president of the California Railroad Commission, spoke particularly of conditions with the Pacific Coast properties.

"Wherever hydroelectric utilities with steam reserves are being separately operated," said Mr. Thelen, "fuel can be saved by making interconnection between the existing systems so that the output of each company will supplement that of the others and so that the reserves of each company will be made available to all other companies. Through such interconnection a considerable portion of the existing steam reserve capacity can be entirely eliminated with a consequent material saving of fuel. One of the Western railroad commissions, on its own initiative, has taken up this matter with the electric companies of the State, and it is hoped that arrangements will soon be made, through interconnection of existing systems, so as to produce greater efficiency in their operation and to eliminate unnecessary steam reserves. At this time, more than ever, efforts should be made to bring about the most efficient operation of all electric utilities, with the attendant conservation of fuel and man power."

Calling the position of the steam railroads of the country as a whole very satisfactory, Mr. Thelen said that "the same statement cannot be made with reference to certain of the street railroads, gas and electric companies, warehousemen and other utilities. These classes of public utilities, as a whole, have not enjoyed the increase in business which has come to most of our steam railroads. To the applications of these utilities for authority to charge higher rates, based on large increases in operating expenses, frequently without commensurate increases in the volume of business, the various state commissions must give prompt and sympathetic consideration. In a number of instances higher rates have already been authorized and in other cases increases must hereafter be allowed. Is it not fair to ask that the public utilities, instead of seeking permission to shift the entire increased costs, shall share with their customers the burden caused by the war?

Mr. Thelen discussed at some length the large problem of financing public utilities during the war and the successful policy of selling securities to the local public. Concerning the great need of hydroelectric development he said:

"The development of additional electric energy, particularly in those portions of our country in which other forms of fuel are not readily available, is a pressing problem. The further development of our industries and the increase of our national efficiency require that where water power is readily available for the generation of electric energy, its development should be encouraged. Where such water powers are on government lands, a constructive policy should be adopted so that development may proceed under conditions just and reasonable both to the utilities and to the public."

NEW TRADE ACTIVITIES OF ASSOCIATED MANUFACTURERS

Industrial and Street-Lighting Fixture Section and Insulating Materials Section Formed to Extend Association Idea

At the meeting of the lighting fixture section of the Associated Manufacturers of Electrical Supplies on Oct. 2, at the New York offices, it was decided that the interests of the respective manufacturers could be served best by segregating the work of the industrial reflector and street-lighting manufacturers in a separate section, the interior-lighting fixture manufacturers to continue as an independent section.

The new section will be known as the industrial and street-lighting fixture section. C. O. Baker, Wheeler Reflector Company, Boston, was elected chairman of the new section; C. E. Stephens, Westinghouse Electric & Manufacturing Company, secretary, and W. H. Jones, General Electric Company, treasurer. The section has outlined extensive plans for an active year and it is felt that it will prove of great advantage and benefit to the manufacturers interested. All manufacturers of reflectors, industrial and street-lighting fixtures and parts, members of the association, are eligible for affiliation with the section.

Insulating-Materials Section Formed

Manufacturers of miscellaneous insulating materials held the second meeting at the association offices, New York, on Sept. 20, and voted unanimously to form a section in the association, to be called the insulating-materials section.

This section will include manufacturers of treated cloths, treated papers, built-up mica, raw mica, insulating varnishes, insulating cements, friction tape, splicing compound, untreated tapes and other miscellaneous insulating material.

It was planned originally to include these manufacturers as a committee of the molded or formed insulation section, but it was found that this would make the section too large and unwieldy, and it was felt that better results would accrue to all by forming an entirely separate section, where the manufacturers would have common interests.

J. G. Miles, Westinghouse Electric & Manufacturing Company, was elected chairman of the section; J. B. Adams, Mitchell-Rand Manufacturing Company, secretary, and A. E. Beling, Western Electric Company, treasurer.

Work of the Porcelain Section

The porcelain section held its regular fall meeting on Oct. 3, at the association offices. The following officers were re-elected unanimously for the coming year: J. E. Way, R. Thomas & Sons Company, chairman; C. M. Semler, Pittsburgh High Voltage Insulator Company, secretary; B. B. Dinsmore, Imperial Porcelain Works, treasurer.

In accordance with the plan of the recently formed tariff committee of the association, that each section appoint a special tariff committee to work with the association tariff committee, H. R. Holmes of R. Thomas & Sons Company, East Liverpool, Ohio, and B. B. Dinsmore, Imperial Porcelain Works, Trenton, N. J., were appointed members of the section committee, Mr. Holmes being chairman. In addition to the regular standing committees of the section, the following committees were also appointed:

Freight classification committee—B. F. McLean, chairman, Ohio Brass Company, Mansfield, Ohio; B. B. Dinsmore, Imperial Porcelain Works, Trenton, N. J.; H. R. Holmes, R. Thomas & Sons Company, East Liverpool, Ohio.

Pin-threading committee—H. R. Holmes, chairman, R. Thomas & Sons Company, East Liverpool, Ohio; B. A. Plimpton, Locke Insulator Manufacturing Company, Victor, N. Y.; C. M. Semler, Pittsburgh High Voltage Insulator Company, Derry, Pa.; E. B. Snyder, Ohio Brass Company, Mansfield, Ohio.

Committee on Japanese matters—B. A. Plimpton, chairman, Locke Insulator Manufacturing Company, Victor, N. Y.; B. B. Dinsmore, Imperial Porcelain Works, Trenton, N. J.; F. L. Bishop, Hartford Faience Company, Hartford, Conn.

Officers of Molded or Formed Insulation Section

The molded or formed insulation section held the regular fall meeting on Oct. 5, at the association offices, E. B. Hatch, Johns-Pratt Company, chairman, presiding.

The following officers were elected unanimously for the coming year: R. W. Seabury, Boonton Rubber Manufacturing Company, Boonton, N. J., chairman; Henry T. Meyer, Duranoid Manufacturing Company, secretary; Joseph Rockhill, General Insulate Company, treasurer.

Lend the Price—Buy Liberty Bonds

TIMELY NEW-BUSINESS DISCUSSION IN OHIO

Problem of Providing for Depreciation for Property Purchased Now When Lower Values Have to Be Faced

Appliance sales, patriotic endeavors, new-business financing and factory illumination were the chief topics discussed at the meeting of the new-business co-operations committee of the Ohio Electric Light Association at Cincinnati on Oct. 10. The meeting brought out more discussion of the broader problems facing the industry to-day than has been usual at the gatherings of this committee. At the same time ideas on the details of selling plans were not lacking.

G. E. Miller, sales manager Cleveland Electric Illuminating Company, in an address on "What Are You Doing About New Business?" outlined very clearly the position of the central station in the present situation. He reviewed the difficulties in keeping construction going apace with demand, in finding capital for extensions, and in adjusting rates so that the effect of readjustment would not react against the company. An abstract of the paper by Mr. Miller is published elsewhere in this issue.

The discussion showed that practically all Ohio companies are operating under some plan which passes on the immediate cost of extensions in whole or in part to the customer who demands service. The most serious problem confronting Ohio operators seems to be that of finding means of providing, when conditions again become normal, for the depreciation which will take place on equipment purchased now. This difficulty is

seen to be the more real on account of the practices governing valuations in rate cases.

D. L. Gaskill of Greenville, in a patriotic address at luncheon, urged utility men to assist in every way in getting the public more interested in the war and in getting people more nearly into the right frame of mind to make sacrifices for the nation.

Ward Harrison of Cleveland spoke on the money value of efficient factory lighting.

Walter E. Ott of Cincinnati spoke on appliance sales policies and gave a vacuum cleaner demonstration.

At the next meeting, which will be held in Toledo on Nov. 21, not Oct. 21 as was printed in the Oct. 6 issue of the ELECTRICAL WORLD, it is planned to devote the session to the subject of appliance sales, with speakers from three branches of the appliance sales industry. The speakers will be Earl E. Whitehorne, ELECTRICAL WORLD, New York; R. E. Flower, Erner Electric Company, Cleveland, and E. W. Quillan, Elyria, Ohio.

Do You Like Liberty?—Lend for It

REGULATIONS GOVERNING TRADING WITH THE ENEMY

New War Trade Board the Administrative Body—Sweeping Powers of Federal Trade Commission Regarding Patents

President Wilson has appointed a War Trade Board as the administrative machinery to carry out the provisions of the recently enacted trading with the enemy act. He has also proclaimed regulations for the administration of the act, giving to the Federal Trade Commission sweeping powers in regard to patents, even to the fixing of prices of articles and products necessary to the health of the military and naval forces of the United States "or the successful prosecution of the war." In addition, the President has created a Censorship Board, with full power to censor cable, radio and mail communications between the United States and foreign countries, and has announced that he will appoint an "alien property custodian" and will establish control over foreign-language newspapers printed in the United States, the transportation of enemies, clearances of vessels transporting cargo, and control over foreign exchange and transfers of gold. In some of these respects the proclamation establishes regulations for carrying into effect the espionage act as well as the trading with the enemy act.

The new War Trade Board will supersede the Exports Administrative Board, although Vance McCormick, chairman of the latter, will remain chairman of the new board. The members of the old board will go over to the new board, although several new members will be named. The headquarters of the board will remain for the present at 1435 K Street N. W., Washington.

In addition, the President will soon appoint a War Trade Council, to serve in an advisory capacity to the new War Trade Board.

The provisions of the proclamation in regard to patents and the Federal Trade Commission powers follow:

I further hereby vest in the Federal Trade Commission the power and authority to issue licenses under such terms and conditions as are not inconsistent with law, or to withhold or refuse the same, to any citizen of the United States or any corporation organized within the United States; to file and prosecute applications in the country of an enemy or ally of enemy for letters patent or for registration of trade-mark, print, label or copyright, and to pay the fees required by law and the customary agents' fees, the maximum amount of which in each case shall be subject to the control of such commission; or to pay to any enemy or ally of enemy any tax, annuity or fee which may be required by the laws of such enemy or ally of enemy nation in relation to patents, trade-marks, prints, labels and copyrights.

I hereby vest in the Federal Trade Commission the power and authority to issue, pursuant to the provisions of Section 10 (c) of the trading with the enemy act, upon such terms and conditions as are not inconsistent with law, or to withhold or refuse, a license to any citizen of the United States, or any corporation organized within the United States, to manufacture or cause to be manufactured a machine, manufacture, composition of matter, or design, or to carry on or cause to be carried on a process under any patent, or to use any trade-mark, print, label or copyrighted matter owned or controlled by an enemy or ally of enemy, at any time during the present war, and also to fix the prices of articles and products manufactured under such licenses necessary to the health of the military and the naval forces of the United States or the successful prosecution of the war, and to prescribe the fee which may be charged for such license, not exceeding $100 and not exceeding 1 per cent of the fund deposited by the licensee with the alien property custodian as provided by law.

I hereby further vest in the said Federal Trade Commission the executive administration of the provisions of Section 10 (d) of the trading with the enemy act, the power and authority to prescribe the form of and time and manner of filing statements of the extent of the use and enjoyment of the license and of the prices received and the times at which the licensee shall make payments to the alien property custodian, and the amounts of said payments, in accordance with the trading with the enemy act. I further hereby vest in the Federal Trade Commission the power and authority, whenever in its opinion the publication of an invention or the granting of a patent may be detrimental to the public safety or defense or may assist the enemy or endanger the successful prosecution of the war, to order that the invention be kept secret and the grant of letters patent withheld until the end of the war.

The said Federal Trade Commission is hereby authorized to take all such measures as may be necessary or expedient to administer the powers hereby conferred.

The President Asks It—Buy a Bond

NEW COMMITTEES OF THE ILLUMINATING ENGINEERS

Will Handle Problems of Illumination for Aviation Cantonments, Lighting Practice in Industrial Establishments and Visibility at Sea

Three committees have been organized recently by the Illuminating Engineering Society to handle problems of illumination of aviation cantonments, to codify lighting practice in industrial establishments, and to carry on investigations on problems of visibility at sea. This was brought out in the report of Clarence L. Law, the general secretary, presented at the annual meeting of this society, which was held at the Engineering Societies Building, New York City, on Thursday, Oct. 11.

After the reading of the annual report of the secretary a monthly meeting of the New York Section was held. This was devoted to a color symposium by the following: M. Luckiesh, H. C. Richards, Beatrice Irwin, L. T. Troland, I. G. Priest, C. E. Ferree and G. Rand.

COAL BUREAU FOR THE INDIANA ASSOCIATION

Committee Appointed to Investigate Advantages That Might Accrue to Utilities from Such an Organization

At a meeting of the executive and advisory committees of the Indiana Electric Light Association at Indianapolis, Oct. 11, a committee was appointed to investigate the advantages that might come from an association coal bureau which would see that state electric companies were supplied with fuel, and would also co-operate with the national bodies established to regulate fuel distribution. The members are: Thomas F. English, Muncie, Ind., chairman; C. C. Perry, Indianapolis; H. H. Harrison, Indianapolis, and Thomas Donahue, Lafayette.

Mr. Donahue, who is also secretary of the Indiana association, will write to member companies to ascertain what stand they will be disposed to take in the matter of the coal bureau, as it is expected that these companies will support the bureau if it is established. J. P. Ohmer of the Indiana & Michigan Electric Company, Elkhart, presided at the joint committee meeting.

Hit the Trail, Buy That Bond Now

COAL SUPPLY CONDITIONS ARE VERY ACUTE IN OHIO

Hope for Freer Supply When Cold Weather Closes Navigation to the Northwest—Stocks Are Small

Central station companies throughout Ohio have had great difficulty for several weeks in securing a sufficient supply of coal to keep plants in operation. Even those having long-time contracts which would have entitled them to first consideration under ordinary circumstances have enjoyed no advantage over others. This is due, partly at least, to the United States government's priority order which requires the shipment of the greater part of the production in this section of the country—including Ohio, Pennsylvania and West Virginia—to the Northwest by way of the Great Lakes. Producers had taken orders from buyers in the Northwest early in the spring at high prices, and of course they would prefer to deliver this coal rather than ship to buyers who pay the lower prices which were fixed by government order a few weeks ago. This is another trouble. A third and very important one is a shortage of coal cars on all railroads.

The reason for shipping all the coal possible to the Northwest while lake navigation is open is the severity of the winters and the difficulty of sending coal by rail to that section in severe weather. That section has depended upon its supply from these coal fields for years, and the conclusion was reached that the task this fall should be accepted by the same fields.

At the office of the Cleveland Electric Illuminating Company it was said that great difficulty is experienced in getting coal just now, but that there is a very small supply on hand and a few cars have been coming in from time to time to keep the plants in operation. The Cleveland municipal plant has been on the verge of closing down several times, but a supply was received on each occasion in time to prevent this result. Light and Heat Commissioner Davis has made several trips to Washington to consult with Coal Administrator Garfield over the situation, with the result that a sufficient amount of coal has been ordered shipped from time to time to tide the plant over the difficulty. For the last two weeks little has been said in regard to fuel for this plant, but it has little, if any, surplus to insure continued operation if shipments should fail.

Coal men say that many central station plants are operating with very short coal supplies, but they have not heard of any that have had to close down. J. M. Roan has been acting at Columbus as fuel commissioner under state authority, and has succeeded in keeping a limited supply of coal moving to most of the towns where severe shortages have occurred. Coal operators have shown a willingness to give relief whenever the authorities waived the priority order on shipments needed in the towns of the State.

Two cars of coal were received by the city light and water plants at Hamilton on Oct. 16, and a car per day has been promised, just about enough to supply both. Apparently these plants have been running close to shore for a time.

Close of Lake Navigation Will Release Coal

It is very probable that the situation will remain acute until the close of lake navigation on Dec. 1. After that the product of the mines will be released to take care of industrial and public utilities plants. Coal Administrator Garfield was in Cleveland on Oct. 12, when he consulted with city authorities and business men as to their needs and the needs of other places in the State. Homer H. Johnson, a prominent Cleveland attorney, was appointed Ohio coal administrator, and in turn he will name committees in all cities to keep him informed of their needs. He cannot dictate the movement of coal, but will work in conjunction with the federal Coal Administration. It is hoped that some relief will result from this, although domestic needs must be considered at once. Domestic supplies in all cities are very short.

The high prices all through the season prevented consumers from accumulating stocks as they usually do through the summer months. Because of this neither public service nor private plants have reserve supplies to depend upon in this emergency. Or, if they have, the stocks are so small that they amount to very little. Although prices were very high, coal men urged consumers to put in reserve stocks before the situation became so strenuous, but a majority of buyers felt that conditions were abnormal and that they would be able to get their fuel later at more reasonable figures. In this they were correct, but the pressure on the supply became more drastic until the culmination in present conditions. Nothing of this kind was ever experienced in Ohio before.

The Columbus Railway, Power & Light Company was obliged to stop cars on two occasions last week, once immediately and directly on account of shortage of proper fuel, and the other time on account of trouble primarily caused by not having proper fuel. On many occasions what has been sold to the company as fuel and looked like it on top of the car has turned out to be mostly dirt, and sometimes when such fuel has been put in storage this fall a fair crop of vegetation has grown in it. The company, however, expects that

the authorities will let it have at least enough coal to keep the property operating, as there is plenty of fuel passing by and through Columbus.

KENTUCKY STRIKE OVER

Resumption of mining operations in the southeastern Kentucky-Tennessee coal field will go a long way toward relieving a situation in the Central West which in numerous cases had brought electrical utilities to the verge of a coal famine and had subjected them to increased outlays in order to obtain the fuel they needed. Work was resumed by about 20,000 miners on Oct. 8 under an agreement by which differences during the war are to be submitted to arbitration. The strike lasted nearly two months and involved a producing area with a normal output of 50,000 to 75,000 tons of bituminous coal a day.

Dr. Garfield has telegraphed labor leaders and operators in the Southwest, where strikes are threatened, that "strikes must not take place."

Best by Test—New Liberty Bonds

TO-DAY IT IS EVERYBODY'S BUSINESS TO SAVE COAL

Van H. Manning Says That We Cannot Scrap All Out-of-Date Power Plants—The Personal Problem

Talking to a representative gathering of men who are to assist the Fuel Administration in the different states at their meeting in Washington with Dr. H. A. Garfield, Van H. Manning, director of the Bureau of Mines, Department of the Interior, said concerning the necessity of urging the economical use of fuels:

The economical use of fuel has proved to be no simple problem. The coal, the equipment, and the human variables make hard and fast general rules impossible. The Bureau of Mines has carried on extensive experiments to determine the fundamental principles of the combustion process and of furnace design, and at the same time has been making practical application of improved practice in government power plants. Many publications are available which show the progress of the work along these lines.

Americans have been as wasteful of coal as of other resources, largely because coal has been abundant. To many consumers it has seemed hardly worth while to give time and thought to the saving of coal.

Conditions have suddenly changed. To-day it is everybody's business to save coal. Coal is the foundation stone of industry. Without it the production of equipment for war must halt. Transportation facilities must stand still. One man's careless and waseful use may mean an idle factory or a cold house for his neighbor. With the world looking to us largely for its coal supply, with increased demands at home, with a scarcity of available labor, with overtaxed transportation facilities, the consumer of coal must pause and give serious consideration to the problem which confronts the country.

If the consumers can be aroused to an intelligent consideration of the burning of coal, they can begin to save 10 per cent of the production at once. With more effort, through instruction and a moderate remodeling of coal-burning equipment, which could all be accomplished during the war, a further considerable saving can be made. The possible coal saving when present practice is compared with the best ideal practice is very large. If it were possible to supply the need of this country for light, heat and power through the highest type of mechanical devices, and if we could make a skilled coal user out of the average user, we could probably get along with half as much coal as we are now consuming. This ideal is far beyond present realization.

The immediate problem is a difficult one. We cannot scrap all out-of-date power plants. We must start by doing the best with what we have. We must begin saving coal at once. The problem is personal. It deals with the human element. We must reach the man with the shovel.

About 15,000,000 people shovel the 20 per cent of our coal used for domestic purposes. Only about 250,000 firemen shovel the 60-odd per cent of our coal used by power plants and railroads. While we must appeal to the householder to save coal, it is vastly more important to reach the fireman through whose hands the larger part of our coal passes.

The householder must realize that when he throws a shovelful of anthracite coal into his furnace its value is equivalent to half a pound of sugar, or half a loaf of bread, or a pint of milk. He must appreciate that it is worth while to examine his house and to overhaul his heating equipment. Weather strips, double windows, pipe coverings, clean flues and chimneys, and tight fittings in ash-pit, doors, dampers and furnace parts will all pay. Damper control is one of the chief secrets of economical heating. Clean surfaces are most essential, as soot is a poorer conductor of heat than asbestos. Care, attention and taking pains will be the greatest factors in saving domestic coal.

The fireman is, however, the biggest single factor to be considered in a campaign to secure the largest saving of coal. Many manufacturers have made a serious mistake in failing to consider the fireman as a skilled worker. Too often he is treated as a roustabout. He is not well instructed or given proper labor-saving devices. As coal increases in price or becomes difficult to get, the fireman handles more and more of his employers' money. His efficiency means more in dollars and cents. This is an encouraging feature in the situation. It means a better recognition of the importance of the fireman, more efficient work on his part, and a consequent increased saving of coal. The viewpoint is changing. It is no longer cheaper to pay for the coal than to educate the firemen.

In carrying out a campaign to promote the saving of coal let the appeal be made to the householder to cut down his consumption in every way possible, but above all, give serious consideration to methods by which a systematic relationship may be established between the office and the fireman. Encourage the manufacturer to take a keener interest in his fuel consumption and to back up his fireman by giving him the best information and equipment available. This problem has two phases—first to arouse the interest of the manufacturer and his engineer and fireman and to point out the part which they can pay in relieving the present crisis in coal supply; second, to furnish whatever technical information may be desirable and which will be immediately applicable to accomplish the result sought.

Your Liberty Is at Stake—Save It

ORDER OF PRIORITY IN DISTRIBUTION OF COAL

Railroads, the Government, Domestic Users, Public Utilities and All Commercial Organizations the Indicated Order

The first of a series of orders to distribute coal on a priority basis and regulate the movement of coal cars has been issued by Fuel Administrator Garfield. It provides that the Pennsylvania Railroad, which serves about 700 mines, shall have its needs properly taken care of. Other railroads will be served through similar orders to follow soon and to comprise the first series.

Commercial coal will be distributed by the second series, giving preference in order to the government, domestic users, public utilities and all commercial organizations using coal.

INCREASE IN EARNINGS OF BOSTON EDISON COMPANY

Great Gain in Sales of Electrical Energy for Power Results from War-Time Industrial Activity That Has Prevailed

An increase of over $900,000 in gross earnings is reported by the Edison Electric Illuminating Company of Boston for the year ended June 30, 1917, as compared with the previous year. For 1917 the total was $9,255,958; the number of customers increased from 86,018 to 97,323, and the output delivered at the switchboard from 223,258,020 kw.-hr. to 249,235,384 kw.-hr.

The industrial impetus due to the war is reflected in power sales totaling 63,595,719 kw.-hr. for 1917 compared with 35,874,751 kw.-hr. in 1916. The company consumed 223,438 tons of coal this year, against 198,951 tons last year. On June 30, 1917, the coal on hand totaled 40,885 tons. The output for metered commercial lighting actually fell off this year to 86,513,020 kw.-hr., as against 89,443,403 kw.-hr. in 1916. The ratio of operating expenses to gross earnings was 55.6 per cent in 1916 and 58.74 per cent this year. Power sales increased $414,579 this year, the total revenue from this class of business being $1,897,286.

The average cost of coal per ton remained practically the same, being $3.78 in 1916 and $3.76 in the 1917 fiscal year to June 30. The total connected load of the system June 30, 1917, was 278,051 kw., of which 141,246 kw. represented lighting service and 136,805 kw. power and street railway customers. The total steam generating capacity of the company at the end of the fiscal year was 160,600 hp., the combined generator ratings being 116,400 kw. The company's employees increased from 1973 to 2186 during the year. Production cost increased from $1,420,122 to $1,814,533.

The principal items of expense this year were: Manufacture, $1,814,533; electricity purchased, $22,263; distribution, $1,142,663; office expenses and management, $1,196,032; taxes, $1,022,564; miscellaneous, $259,866; total, $5,457,924; balance to profit and loss, $3,798,033. The company paid 12 per cent in dividends, $2,703,066, during the year.

Comparative earnings were:

	Year Ended June 30 1916	1917
Municipal commercial lighting	$5,653,226	$6,143,310
Municipal arc lighting	488,808	490,684
Municipal street incandescent lighting	377,463	394,612
Power (except street railways)	1,482,707	1,897,286
Power (street railways only)	197,361	202,147
Energy sold other plants	103,248	107,737
Total net from sale of electricity	$8,302,814	$9,235,778
Income from rentals	.....	20,180
Total	$8,302,814	$9,255,958
Peak load in kw	72,802	80,539
Peak load date	Dec. 13, '15	Dec. 12, '16

Charles L. Edgar, the president, says in part in the annual report:

Numerous transmission lines, distributing lines and additional transforming apparatus have been installed, but all in the way of routine, for the purpose of taking care of the ordinary growth of the business.

During the year your company has combined with the New England Power Company in making a joint contract with the Metropolitan water board for the purchase of the hydroelectric energy generated at the Clinton dam. The water board has agreed to connect the substation at the Clinton dam with the one at the Sudbury dam, the output of which is already being purchased by your company. The completion of this construction will make it possible to transfer from the lines of the New England Power Company to the lines of your company, or vice versa, approximately 5000 kw., which will in case of emergency be of very great value.

Arrangements have also been made for connecting the lines of your company with those of the Suburban Gas & Electric Company at Revere, which latter company has connection with the Malden Electric Company and the Salem Electric Lighting Company.

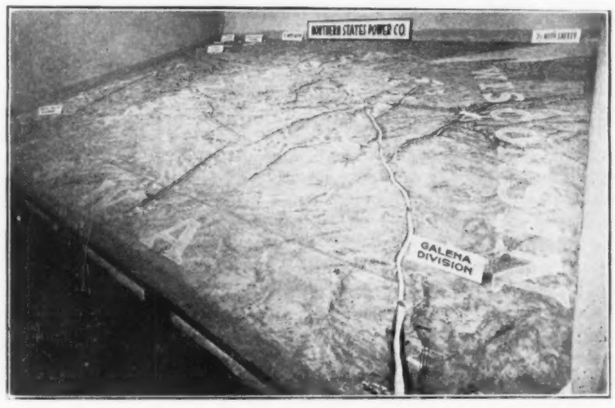
Ever since the beginning of the European war electric companies in England have been making serious efforts to connect their lines together for safety in case of emergency. We in this country are beginning to appreciate the desirability of following out this policy, and your company is doing what it can in helping to safeguard the general electric situation in eastern Massachusetts.

Take No Chances—Buy for Liberty

ELECTRICAL INDUSTRY AT MINNESOTA STATE FAIR

Minneapolis Electric Trade Gets Together to Boost Business and Advertises Advantages of Electricity to 200,000 People

The idea of having an electrical show at the Minnesota State Fair at Minneapolis in September was originated by the local chapter of the Jovian Order and was conducted under the auspices of that organization. The first move was to appoint a committee in charge of arrangements, and this committee named Norman



TERRITORY OF NORTHERN STATES POWER COMPANY

O'Neil of the Minneapolis General Electric Company as general manager of the show.

One of the features was a large relief map of the territory served by the Northern States Power Company in Minnesota, North Dakota, South Dakota, Wisconsin, Illinois and Iowa. The map depicted 800 miles (1287 km.) of electrical transmission system, eleven water powers with 93,500 hp. rating, and 189 cities, towns and villages served. The electrical effects were spectacular. Water powers and rivers were thrown into strong relief. The night effect was further elaborated by twinkling stars and a canopy which suggested the sky. The map, which measured 16 ft. by 20 ft. (4.8 m. by 6 m.), was prepared at the suggestion of H. E. Young, sales manager Northern States Power Company. Frequent lectures were delivered during the fair at the company's booth to interest visitors in the company customers' ownership plan.

Commission Rulings

Important decisions of various state bodies involving or affecting electric light and power utilities.

Indiana Commission Authorizes Bond Issue.—The Indiana Public Service Commission has granted authority to the Interstate Public Service Company to cancel certain "free service" rates in Lebanon, Lowell, Kentland, Crown Point and Monticello. It has also given the company authority to issue $41,000 bonds at not less than 80 to reimburse the treasury for betterments at various plants.

Charges for Inspection of Electric Installation.—The Philippine Islands Public Utility Commission, in a case affecting the Lucena Electric Light, Ice & Water Company, holds: "An electric company assuming the responsibility of any loss of life or property of private citizens resulting from fires caused from inadequate or defective installation is entitled to charge a fee for inspecting installations made by persons not connected with the company."

Abandonment of Line. — The Dunkirk Street Railway (leased to the Buffalo & Lake Erie Traction Company and operated by the receiver for that company) sought approval from the New York Public Service Commission, Second District, of a declaration of abandonment of portions of the constructed route of the railway in Dunkirk. It was held that before the commission approves the abandonment of a railroad operating only within the city limits, upon the ground that the road is operated at a loss, it should be shown whether the deficit arises from the operation of that road or whether its connection with and control by another road is responsible for its failure to meet expenses.

War-Time Restrictions on Service Expenditures.—The Massachusetts Public Service Commission disapproves restrictions upon new construction which were established by the New England Telephone & Telegraph Company as a result of war conditions. It says in part: "The policy of restricting telephone installations did not start with the parent company, but seems to have been adopted by the New England company upon its own responsibility, and no evidence was offered that any of the operating companies throughout the country have pursued a similar course. It also appears that the Western Electric Company has not warned the New England company of any impending shortage in materials and supplies or urged a restriction of purchases on this account during the summer; indeed, the Western Electric Company has been endeavoring by an advertising campaign to stimulate the sale of electric supplies of far less basic public importance than telephone apparatus. Nor has the new policy been directly advised or suggested by the National Council of Defense or any similar public body. The execution of the policy has apparently been left very largely in the hands of the local 'counter' men, who deal in the first instance with prospective customers. Since its adoption, and up to the time of the public hearings, about 1800 out of 3000 applicants have been denied new telephone service. As the resources of the country are devoted more and more to the prosecution of the war, there will be a continually increasing need for conservation and the exercise of strict economy on the part of every individual. It is not so clear, however, that this principle has been reasonably applied in the present instance. At the outset no official announcement was made to the public or to this commission of any change of policy. Certainly the customers were given no definite means of knowing, in default of an appeal, what the instructions were or whether their privileges were being infringed. So far as the policy itself is concerned, it would have been perfectly consistent with the public interest, and desirable, for the company to have circularized its subscribers, or to have issued statements to the press setting forth the need for conservation of resources and strict individual economy in the present emergency and strongly urging the public to refrain from seeking additional and unnecessary telephone facilities. The commission, indeed, would very gladly have co-operated in such a movement. We are inclined to believe that such a policy ought not to be adopted until it has been directly advised by some central national authority representing and acting in the public interest, nor until it is made to apply, not solely in certain New England states, but uniformly throughout the entire country. The amount of conservation of basic materials and of other wealth which can be effected by limiting telephone service is relatively insignificant. Infinitely greater opportunities exist which relate to mere luxuries of living. The commission, therefore, expresses the opinion that the policy adopted by the company is not as yet justified."

Proof of Necessity for Increased Rates.—A case decided by the Maryland Public Service Commission, affecting the Kensington Railway, contains the following statement of policy: "In a case brought by patrons of the road to test the reasonableness of an increase of rates, while the burden of proof may be primarily upon the complainants, it would also appear to be a sound rule that where the increase will create a condition different from the common practice of utilities of the class to which the corporation belongs, and where the company seeks to justify it because it has assumed liabilities that are not necessary for the promotion of the specific service which the utility undertakes to perform, the burden of proof should be shifted to the corporation."

Recent Court Decisions

Findings of higher courts in legal cases involving electric light, power and other public utility companies.

Damage from Fire in Burning on Right-of-Way. — In an action against defendant electric power corporation for damages, held, under evidence, that questions of its negligence in burning on right-of-way and whether fire was the proximate cause of the burning of plaintiff's timber and fencing were for jury, according to the Court of Appeals of Maryland in Susquehanna Transmission Company versus Murphy (101 A. 791).

Sidewalk Barricades About Pole.—A barricade on a sidewalk in front of a building on which alterations are being made is not required to be impassable, where openings for the ingress and egress of workmen and materials are necessary, and a substantial notice of exclusion is sufficient for persons who have reached the age of discretion, the Supreme Court of South Carolina held (98 S. E. 398). In an action for personal injury from the dropping of a monkeywrench by defendant's employee at work on a telephone pole inside a barricade, plaintiff's admission that he knew of the notice to "keep out" was irrelevant and inadmissible. In such an action testimony of an experienced telegraph lineman who qualified as an expert that it was dangerous to carry a monkeywrench in a body belt was admissible, although the witness himself had not so carried one.

Unwarranted Obstruction of Highways by Poles.—Telephone poles set against the fence along the west side of a highway in themselves did not constitute an unwarranted obstruction thereof, the Supreme Court of South Dakota held (164 N.W. 104). The right to use a public highway for telephone poles, created by law, does not relieve the telephone company from liability for injuries to persons caused by negligence or improper construction or maintenance of its line. The company had no right to construct its line in such manner as to place an unnecessary or dangerous obstruction in the highway. In an action for injuries to plaintiff sustained when tipped by a telephone-pole guy wire out of his saddle while he was pursuing along the side of the highway cattle he was assisting in driving to market, question whether plaintiff's act in leaving the traveled part of the road and proceeding at great speed along the untraveled way when it was so dark that plaintiff could not see obstructions was contributory negligence, was one for the jury to decide. In such action the question of the telephone company's negligence in constructing and maintaining the guy wire in the highway, though in the untraveled part, was also one for the jury.

Associations and Societies

A complete Directory of Electrical Associations is printed in the first issue of each month on the next-to-last text page.

California Association of Electrical Contractors and Dealers.—The quarterly meeting of this association was held at Fresno, Cal., Oct. 12-13.

Utah Society of Electrical Contractors.—The first convention of the Utah Society of Electrical Contractors was held in Salt Lake City, Utah, Oct. 5 and 6.

Jovian Electric League, Los Angeles.—At the meeting of the Jovian Electric League held Oct. 3 Capt. J. Carl Schindler, U. S. A., spoke on "The Electricized Army."

Jovian League of San Francisco.—James W. Gerard, formerly United States Ambassador to Germany, spoke before the members of the Jovian League and the San Francisco Advertising Club at a joint meeting held Oct. 3.

Some Recent Advances in Industrial Lighting Equipment.—Ward Harrison presented a paper on "Some Recent Advances in Industrial Lighting Equipment" at the first fall meeting of the Pittsburgh Section of the Association of Iron and Steel Electrical Engineers on Oct. 20.

Cleveland Section of the Association of Iron and Steel Electrical Engineers.—The first fall meeting of the Cleveland Section of this association was held Oct. 13, and two papers were presented, "Industrial Electrical Control," by L. W. Egan, and "Electrical Reversing Blooming Mills," by R. D. Nye.

Kansas City Jovians Elect Officers.—The Kansas City Jovian League elected the following officers at its annual meeting: President, A. P. Denton; first vice-president, W. M. Hand; second vice-president, J. E. Launder; third vice-president, W. B. Saterlee; fourth vice-president, F. F. Rossman; secretary and treasurer, T. R. Harber; executive committee—P. Lloyd Lewis, M. E. Bates, J. G. Crane, E. E. Stigall.

Oklahoma Jovians Meet.—The Jovian Electric Club of Oklahoma City, Okla., held its annual election of officers recently, with the following result: President, O. K. Corken, president Corken Machinery Company; vice-president, William H. Stout, president Southwestern Electric Company; secretary-treasurer, Arthur L. Mullergren, secretary-treasurer Benham Engineering Company. The following executive committee has been appointed: O. K. Corken, chairman; William H. Stout, A. L. Mullergren, F. J. Meyer and H. E. Musson. The club holds a weekly noonday meeting and luncheon on Monday. A banquet and rejuvenation were held on Sept. 28.

Rochester Meeting of the American Physical Society. — The nineteenth meeting of the American Physical Society will be held in Rochester, N. Y., Oct. 26 and 27. The society members will be the guests on this occasion of the Bausch & Lomb Optical Company, the Taylor Instrument Company and the Eastman Kodak Company. One session will be held at the works of each of these companies, and at these sessions representatives of the companies will address the society on the scientific work of the company's research laboratories. At this meeting physicists will have an opportunity to observe the extent to which physics is being used in the laboratories and factories of these companies. The Physical Society has centered its activities around the universities. The recent growth, however, of industrial physics has made it desirable that this condition be changed, and consequently the committee on technical physics is making an attempt to secure a close co-operation between the university physicists and industrial physicists by holding at some industrial laboratory or in some industrial center once every year a meeting similar to the one announced.

Fifth Annual Convention of the Southeastern Section of the N. E. L. A.—Following is the outline of the program which will be presented at the fifth annual convention of the Southeastern Section of the National Electric Light Association, to be held at Birmingham, Ala., Oct. 24-26. The papers to be read are as follows: "Safety," by G. K. Selden of the Southern Bell Telephone & Telegraph Company of Atlanta, Ga.; "Distributing Operating Problems," by J. O. Hardin of the Georgia Railway & Power Company, Atlanta, Ga.; "Electric Contracts," by D. H. Cronheim of the Alabama Power Company, Birmingham, Ala.; "Practical Application of Transformers and Regulators," by L. W. Carnagy of the General Electric Company, Atlanta, Ga.; "The Development of the Induction Watt-hour Meter," by M. C. Rypinski and S. A. Berger of the Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa.; "Comments on the National Electric Safety Code," by P. A. Tillery of the Carolina Light & Power Company, Raleigh, N. C.; "Sale of Securities to Our Consumers," by Carl T. Naumberg of the Henry L. Doherty Company, New York City; "Selling the Electrical Idea," by H. W. Alexander of the Society for Electrical Development, New York City; "The Effect of the War on the Electrical Industry and the Outlook," by William H. Onken, Jr., editor of the ELECTRICAL WORLD, New York City. Talks on subjects to be chosen later will be made by T. C. Martin, secretary of the National Electric Light Association, and President Kennedy of the Alabama Utilities Commission. Patriotic talks by army officers have also been arranged for. On the last day of the convention a trip will be made by boat to Lock Twelve, the site of the hydroelectrical development of the Alabama Power Company.

Current News and Notes

Timely items on electrical happenings throughout the world, together with brief notes of general interest.

Engineering Registration in University of Illinois. — Undergraduate students registered in the College of Engineering of the University of Illinois twelve days after the beginning of registration for the new year included the following: Civil engineering, 151; electrical engineering, 209; mechanical engineering, 217. Total registrations in the Engineering College were 864.

Louisville Company's New 15,000-Kw. Unit in Operation.—The new 15,000-kw. turbine generator for the Louisville Gas & Electric Company was placed in operation on Oct. 3. This makes the total generating capacity of the Louisville company 32,500 kw. It is anticipated that the new turbine will materially reduce the coal consumption per unit of energy manufactured. The engineering department of H. M. Byllesby & Company, under whose supervision the recent improvements and enlargements were designed and executed, is at work on plans for the installation of another 15,000-kw. unit which has been ordered for delivery in August, 1918.

Pacific Gas & Electric Company Seeks Higher Gas Rates.—The Pacific Gas & Electric Company has filed with the California Railroad Commission an application for authority to increase gas rates in all districts except San Francisco to equal an average increase of 12½ per cent over present rates. It requests authority to manufacture and sell gas of an average heating quality of 550 B. t. u. a cubic foot, as compared with a present standard of 600. The company in its application states that if it be granted the increases in rates requested, the net return based upon its estimated revenue, operating expenses and depreciation will be 6.7 per cent on the total amount of capital invested.

Liberty Loan Committee in New York.—The sub-committee on public utilities of the second Liberty Loan in New York City includes the following: George B. Cortelyou (chairman), president Consolidated Gas Company; Nicholas F. Brady, president Edison Electric Illuminating Company of Brooklyn; Henry L. Doherty, president Doherty Operating Company; Alanson P. Lathrop, president American Light & Traction Company; Thomas N. McCarter, president Public Service Corporation of New Jersey; Thomas E. Murray, vice-president New York Edison Company; E. H. Rosenquest, president Bronx Gas & Electric Company, and Arthur Williams, general commercial manager New York Edison Company.

Men of the Industry

Changes in Personnel and Position—Biographical Notes

Guy L. Bayley, who has been engaged on hydroelectric construction work for the Department of the Interior in the Yosemite Valley on the Merced River, has resigned to become assistant to the president of the Federal Export Corporation, 115 Broadway, New York City. Mr. Bayley's immediate work will be to establish the company in the Far East. He left this week for a six months' tour of Japan, Korea, China, Siam, the Straits Settlements, Java, Sumatra and way stations. He has had previous experience in this work, having represented the American Trading Company from 1900 to 1904 in Japan. Mr. Bayley was chief of the mechanical and electrical departments

G. L. BAYLEY

of the Panama-Pacific International Exposition. When the exposition came to a close he opened an office in San Francisco as a consulting engineer.

I. A. Tenger has been appointed chief engineer of the Gold Street station of the Brooklyn Edison Company.

Prof. George B. Thomas, head of the electrical engineering department of Colorado College, Colorado Springs, Col., is on leave of absence.

W. O'Brien has been appointed successor to P. T. Davies as power sales manager of the Montreal (Que.) Light, Heat & Power Company.

S. S. Snyder has been appointed chief engineer of the Sixty-sixth Street station of the Brooklyn Edison company, succeeding G. E. Horton.

G. E. Horton, former chief engineer of the Sixty-sixth Street station of the Brooklyn Edison company, has recently been made inspector of construction for the company.

C. E. Bell has been transferred from assistant superintendent of the Paducah (Ky.) Light & Power Company to the Baton Rouge (La.) Electric Company as superintendent.

George H. Waring has resigned as vice-president and general manager of the Charleston (S. C.) Consolidated Railway & Lighting Company to become manager of the Salt Lake City (Utah) property of the American Public Utilities Company.

H. D. Feuers, general manager of the Fremont (Neb.) Gas, Electric Light & Power Company, has been appointed treasurer and manager of the City Light & Traction Company, Sedalia, Mo., to succeed S. B. Irelan.

P. T. Davies, manager of the power sales department of the Montreal (Que.) Light, Heat & Power Company, has resigned to become manager of the new-business department of the Southern Canada Power Company, Montreal.

H. D. Frueauff, vice-president and general manager of the Montgomery (Ala.) Light & Water Power Company, has been promoted to be assistant to the president of the Empire Gas & Fuel Company, another Doherty property.

Stanley E. Smith has resigned from his position as superintendent of the Ersley Light & Power Company, Plainwell, Mich., to go into the electrical contracting business in Otsego, Mich., having purchased the business and stock of E. A. Tubbs.

G. E. Chapman has been appointed superintendent of division "L" of the Public Service Commission of Northern Illinois, with headquarters at Lacon. For some time Mr. Chapman has been acting superintendent of the division, replacing Keene Richards, who is in the army.

A. V. Wynne, superintendent of the Mansfield (Ohio) Electric Light & Power Company, has been appointed to succeed H. D. Feuers as general manager of the Fremont (Neb.) Gas, Electric Light & Power Company. Mr. Wynne went to Mansfield from the Massillon (Ohio) Electric & Gas Company, where he was superintendent, having formerly been electrical engineer of the Trumbull Public Service Company of Warren, Ohio.

C. M. Benedict, assistant secretary and treasurer of the Charleston (S. C.) Consolidated Railway & Lighting Company, has been appointed vice-president to succeed George H. Waring. Mr. Benedict will be in charge of the operations of all departments of the company and will discharge the duties that heretofore devolved upon the general manager and report directly to the president. The office of general manager will be abolished.

S. B. Irelan, treasurer and manager of the City Light & Traction Company, Sedalia, Mo., has been transferred to the Montgomery (Ala.) Light & Water Power Company, another Doherty property, as vice-president and general manager, succeeding H. D. Frueauff. Mr. Irelan began his utility career as a Doherty cadet at Denver. He was formerly at Fremont, Neb., and later at Bartlesville, Okla., as manager of the Bartlesville Interurban Railway Company.

Obituary

Dr. E. F. Roeber.—It is with sincere regret that we record the death of Eugene Franz Roeber, who passed away, after a lingering illness, Oct. 17. Dr. Roeber was born in Torgau, Germany, Oct. 7, 1867, and was educated at the universities of Jena, Halle and Berlin, receiving the degree of doctor of philosophy from the latter university in 1892. He came to the United States

E. F. ROEBER

in 1894 and was associated with Dr. Carl Hering in Philadelphia for some time in electrical engineering work. He became editor of the *Electrochemical Industry*, now *Metallurgical and Chemical Engineering*, at its foundation in 1902, and under his guidance that publication has become the dominating influence in the electrochemical industry. For the last fifteen years Dr. Roeber also prepared the Digest of Current Electrical Literature for the ELECTRICAL WORLD. He was a founder of the American Electrochemical Society, which elected him its president in 1913-14. Dr. Roeber was also a member of the American Institute of Mining Engineers, American Institute of Electrical Engineers and the American Chemical Society. He served his industry faithfully and with a degree of ability that won the respect and admiration of his colleagues and the public. To him work was a pleasure; he never shirked it, and he performed all that he undertook thoroughly. Dr. Roeber possessed a strong personality coupled with sound judgment. None will lament his loss more than those who have labored beside him these many years, and to whom he was friend, guide, counselor and inspirer. It was a delight to consult with him and a rare privilege to know him.

John Howard Hale, a member of the Connecticut Public Utilities Commission, died at his home at Glastonbury, Conn., on Oct. 12, aged sixty-five.

REVIEW OF TRADE AND MARKET CONDITIONS

News of the Trade for the Manufacturer, Wholesaler and Jobber of Electrical Equipment and Supplies—Notes on Industrial Activities and Business Methods

DIFFERENT COMPLEXION OF ELECTRICAL MARKET

Central Stations, Railways and Telephone Companies Deferring Construction—Industrials and Government Most Important Buying Factors

At no time in the history of the electrical industry has the volume of business and the output of electrical manufacturers been larger than it is to-day. According to all reports that the ELECTRICAL WORLD has received, the volume of business billed for the current year will run more than 25 per cent in excess of 1916, when the industry was working up to the limit. The additional business has been made possible only by more efficient methods and by increased production facilities.

The market, however, is very different from what it is under normal conditions. Utilities—the central stations, railways and telephone companies—and building construction interests formerly contributed a large portion of the market. To-day these interests are noticeable in the market by their absence. Lighting companies are making no addition unless absolutely necessary. The former policy of building lines to develop new sections and districts has been put aside until different conditions obtain. Prices are too high for this development work. The railways are awaiting fare increases before spending any considerable amount of money. The telephone interests are withholding extensions because of the cost and the scarcity of raw materials. All are waiting for better financing conditions.

High prices and lack of money at low rates have acted to curtail building construction in almost every section of the country except perhaps the South and in the case of a few isolated communities elsewhere. New buildings have practically reached the bottom level and contractors are therefore finding little to do.

On the other hand, industrials and the government are in such need of electrical equipment that factories continue to work at maximum output without being able to build up stock. Industrial establishments are turning to electric drive all the time, and their requirements appear to show no abatement.

The government is taking no small part of manufacturing facilities for its own needs. The marine construction program of the government, including both the navy and the merchant ships, the cantonments, concentration camps and the forces abroad have required and still require immense quantities of electrical equipment.

UNUSUALLY LARGE HOLIDAY BUSINESS ANTICIPATED

Local Distributers Accumulating Larger Reserve Stocks of Christmas Goods than Last Year for Quick Delivery

Buying for the Christmas or holiday trade as yet has not materialized, excepting in spots. Jobbers and distributers declare that while the hardware people are making larger commitments than before, their operations are a minor factor so far as strictly holiday goods are concerned. They are maintaining customary stocks, with some of the more important establishments arranging for a special Christmas campaign in due season. The department stores are not in the market to any great extent. Their season is about opening, with the heavy buying making its appearance along in the latter part of this month and up to about the middle of November.

Local agents and jobbers are accumulating larger reserve stocks of Christmas goods for quick delivery, prices running as high as a 15 per cent increase over those of the previous period. Knowing this, department-store buyers are therefore in no rush to place orders. War conditions, which supposedly influence the public to purchase lower-priced goods, are not in evidence in the slightest degree. So far as the attitude of the buyers is concerned, the call is for the better goods at even higher prices. The current retail buying is along these lines, and it is consequently reflected in the pre-holiday commitments of the prominent department stores, and even in those of the smaller merchants carrying electrical goods. Where appliances in great quantities are needed for the approaching season, orders were placed as far back as February. In an instance of this kind the deliveries are now just being completed. It is averred by the buyer that if the booking of this order had been deferred a month later no guarantee of its delivery would have been made by the manufacturer.

A number of new appliances have appeared in the market for the holiday trade, and a large sale for them is anticipated. It is expected that a strong business will be secured —far exceeding that of any previous season—for the new heating as well as the staple heating appliances. In ranges, percolators, toasters, pads, plate warmers, flatirons, etc., it is also agreed that a new and higher selling record will be made. No change in price has occurred since Sept. 15, excepting in isolated instances for special goods of exclusive manufacture, wherein a shortage of material or expedited delivery is the presupposed cause of the advance. Current prices are, in the main, supposed to hold until the first of the year. This announcement, however, is subject to factory conditions, such as the cropping out of labor demands, already causing trouble; material supply, none too certain, and disturbances which cannot be foreseen at present.

Don't Worry About It—Buy a Bond

A WARNING TO DEALERS ON EXTENDING CREDITS

Speakers at Associated Business Papers' Convention Review Conditions Brought About by Government's War Program

The changing federal attitude toward co-operative business association work governmentally supervised, the effect of priority certificates, the shortage of labor and the possible future tightening of credits early in 1918 were the topics which again and again crept into the talks of railroad presidents, big manufacturers of basic commodities and well-known economists who spoke this week at the Chicago convention of the Associated Business Papers, Inc. Manufacturers urged that all business be acquainted with the fact that co-operative business effort and even price fixing, if it makes for national conservation and efficiency, and is governmentally supervised, will no longer land participants in prison, but will earn them hearty official support. Firms which use basic products were advised to contemplate the fact that the government's steel orders already aggregate sixty days' top-notch output of all steel mills, and these are priority orders. Moreover, government buying has hardly yet begun.

Wasting labor was decried by every speaker, one economist even suggesting that the next six months may see a radical change in this country's commercial distributing system, which permits ten jobbing-house salesmen to call upon the same customer, when one man might take the

entire order. This bold assertion was not made without a full knowledge on the part of the speaker of the advantages of the competitive system in peace times. He frankly questioned whether this economic waste of man power is one the nation can afford in war times.

Neither did the economic waste occasioned by lax methods and an overcrowded field in retail trades escape notice. Dealers will become better business men on account of the war or they will fail, was the opinion. Those who extend credit must and will see to this by refusing credit where manifest inefficiency in retailing prevails. One observer even prophesied that February of 1918 would mark the beginning of this credit-tightening period. But despite this there was no pessimism.

Help to Get It Over—Buy a Bond

FEDERAL SHIPPING BOARD IN MARKET FOR FUSES

Quotations and Delivery Dates Requested on 110,000 Fuses of the Cartridge Type and 37,500 of the Plug Type

Quotations and delivery dates are requested on all or any portion of the following by the United States Shipping Board, Emergency Fleet Corporation, Washington, D. C.:

Item	Quantity	Article
1	35,000	3-amp. N.E.C.S. cartridge fuses, non-indicating
2	15,000	5-amp. N.E.C.S. cartridge fuses, non-indicating
3	10,000	10-amp. N.E.C.S. cartridge fuses, non-indicating
4	25,000	60-amp. N.E.C.S. cartridge fuses, indicating
5	25,000	100-amp. N.E.C.S. cartridge fuses, indicating
6	25,000	10-amp. N.E.C.S. plug fuses
7	12,500	20-amp. N.E.C.S. plug fuses

Unit shipments are to consist of one two-hundred-and-fiftieth of the above quantities. Deliveries are to start about Dec. 1, 1917, and are to continue uniformly until July 1, 1918. Alternatives will be considered on indicating fuses for items Nos. 1, 2 and 3, and for non-indicating fuses on items Nos. 4 and 5; also for refillable fuses for items Nos. 4 and 5. Sample fuses are to be submitted with proposals.

METAL MARKET CONDITIONS

No New Business Being Taken by Copper Producers to Safeguard Government Requirements

A general dullness prevailed during the week in metals. Lead has dropped another cent in price, to 7 cents. Copper, though nominally held at the government figure of 23½ cents, is not to be had from the producers except on old contracts. Sales made in the open market bring 26 cents and better. Producers are taking on no new business in order to safeguard the government in its requirements. Contracts will consume all of the available supply, it is said.

NEW YORK METAL MARKET PRICES

	Oct. 8	Oct. 16
Copper:	£ s d	£ s d
London, standard spot	110 0 0	110 0 0
Prime Lake	Govt. price 23.50	Govt. price 23.50
Electrolytic	Govt. price 23.50	Govt. price 23.50
Casting	Govt. price 23.50	Govt. price 23.50
Wire base	30.00 to 32.00*	30.00 to 32.00*
Lead, trust price	8.00	7.00
Nickel, ingot	50.00	50.00
Sheet zinc, f.o.b. smelter	19.00	19.00
Spelter, spot	8.05 to 8.30	8.17½ to 8.30
Tin, Straits	61.25	61.12½
Aluminum, 98 to 99 per cent.	37.00 to 39.00*	35.00 to 37.00*

OLD METALS

Heavy copper and wire	23.00 to 24.00	23.00 to 23.50
Brass, heavy	14.50 to 16.50	14.50 to 16.50
Brass, light	11.50 to 12.00	11.00 to 11.50
Lead, heavy	7.00 to 7.25	6.00 to 6.25
Zinc, old scrap	6.00 to 6.25	5.50 to 6.00

*Nominal.

THE WEEK IN TRADE

REPORTS from the different trade centers indicate no change over conditions of the last few weeks. Deliveries in general seem to be keeping up well. In some lines, such as lamps for instance, a shortage is felt in almost every section of the country.

Credits are receiving more and more attention although collections are holding up remarkably well.

A movement is on foot to attract capital of the building interests of the country, and to that end a campaign is about to be started in several of the larger cities.

NEW YORK

In general conditions showed no change during the week. Prices are firm, with a tendency in some lines to advance slightly, although it is generally believed in the trade that the price peak has been reached. There is a noticed tendency on the part of buyers to call for extended credits. In fact, the credit situation locally is beginning to receive considerable attention.

The annual electrical show is being held this week, and the exhibits are unusually good and the audience appreciative.

COLLECTIONS AND CREDITS.—Collections remain about normal, with no special complaint of unusual backwardness on the part of debtors. Instances of members of the trade in good standing calling for more time are occasionally mentioned. Credits are held firm, with a tendency to minimize easy accommodation.

STORAGE BATTERIES.—The plants engaged in this branch are running night and day on orders, a large portion of which is for the government, especially batteries for submarines, cruisers and battleships. Private customers are also being satisfied, with delays in shipment of from a month to six weeks. Material is reported as sufficient to meet requirements for some time to come. The Edison Storage Battery Company will make an advance on its entire line of 10 per cent Nov. 1.

ARC LAMPS.—A spurt in the sale of arc lamps is noted in connection with the interior lighting of motion-picture theaters. No particular reason is assigned for this development other than the picturesque effects of the light. At the same time the trade with steel mills and shipyards is reported as falling off, other means of lighting such large areas being available. Deliveries are classed as immediate, with prices undisturbed by current affairs.

CONDUIT.—An order for rigid conduit placed last fall is just being delivered. The delay is attributed largely to a government requirement for 1,800,000 tubes, aggregating, it is reported, 18,000,000 ft. of pipe.

COPPER WIRE.—The price of copper is so uncertain that inquiries for quotations on covered and bare wire are rather indefinite. A rod mill that had a request of this kind replied that it was paying 27 cents; consequently the distributer of the finished goods was naturally "up in the air" as to what his selling figure would be. The latest price for copper in small lots for immediate delivery is 28 to 30 cents. It follows, therefore, that the official status of 23½ cents is nominal only.

GENERATORS AND MOTORS.—As has been pointed out in these columns before, generators of large size are sold up to 1920. Manufacturers state that a unit may be squeezed in and delivered ahead of this dating once in a while, but any new plant in the market for apparatus cannot depend upon delivery for a long time ahead. The demand for motors is not so active.

BATTERIES.—Pronounced activity has developed for dry batteries, a demand jobbers are finding it difficult to meet. Prices seem to be a secondary matter to deliveries. Telegraph and telephone accessories are also in strong demand.

GLASSWARE.—Globes and bowls are held firm at cur-

rent prices. A further advance may be formulated. The shortage of help in all classes is becoming acute in this district. Particularly is this true of electricians, who are in great demand at the navy yard.

CHICAGO

Business in the Chicago territory is holding up well, the main activities being such as reflect the industrial expansion. Copper in some quarters is believed to be not so high as it ought to be when the actual supply of copper that can be had for non-war activities is considered. Preparations for the holiday trade are beginning to be made. Jobbers report that collections are coming in in good shape.

COPPER WIRE.—The base on rubber-covered wire is mainly at 35 cents, there being a few firms which quote 34 cents. The opinion of jobbers on this price seems to be divided. Some say it is a price fair to all concerned; others say it is really too low, considering the actual supply of copper in the market. They cite the further fact that manufacturers in war goods will continue to get priority shipments of copper, and there is a very real possibility that non-munitions purchasers will have to pay a round premium for their share of the red metal.

INDUSTRIAL ELECTRIC TRUCKS.—Chicago manufacturers report their output sold in some cases as much as a year ahead.

STORAGE BATTERIES.—With storage batteries used in submarines, on airships, in trench signaling systems and in every other branch of war activity, there seems little chance of a decrease in the prices or in the demand.

ELECTRIC PLEASURE CARS.—Light cars are moving well. One dealer has sold about thirty in the last few months.

HEATING APPLIANCES.—Devices are selling fairly well, and a more active market is expected.

CHRISTMAS TRADE.—Jewelers are complaining that early Christmas trade has not been up to expectations. This has not deterred manufacturers of electric appliances from stocking up on holiday goods and laying plans to move them through the trade. One of the big concerns, anticipating the troubles of the dealer with clerk shortage, has worked out a plan to help the dealer sell his full quota in spite of the difficulty.

BOSTON

Business continues to show a moderate recession and collections are somewhat harder than a week or two ago. The second Liberty bond campaign is undoubtedly a factor in checking the flow of money through normal channels. Central stations show no general tendency toward departing from their policy of taking in sail with regard to new business unless distinctly off-peak characteristics are in evidence. Commercial departments of public utility companies are quieter than for many years, with a few exceptions where the disposition to encourage development marks an unusually sanguine management. Jobbers are still very busy and large stocks are being carried in many lines of merchandise. There is a decided scarcity in pole-line hardware and in electric radiators. The lamp situation is a bit disquieting, despite assurances from some quarters that the threatened shortage is exaggerated. Motor stocks at the factories are improving, though irregular demands discount the certainty of being able to procure prompt shipments of particular sizes. Central station earnings are very satisfactory, but anxiety concerning the coal situation is holding back business. The demand for hydroelectric power exceeds the available supply and funds are urgently needed for immediate development of New England resources within easy reach of a better market in the Northeast than the industry has ever before seen. Military and naval activities are increasing, and the stimulating influence of the forthcoming governmental destroyer plant to be built at Squantum is already a factor in the labor and material market. Prices will advance 10 per cent Nov. 1 on two types of alkaline battery plates.

MOTORS.—Deliveries are on the whole better, even in sizes above 25 hp. In some quarters the opinion is held that the industrial demand has reached its maximum for the present, though increased sales of motors for indirect and direct war service are anticipated.

STORAGE BATTERIES.—An advance of 10 per cent is scheduled for Nov. 1 on the "A" and "B" type of Edison battery plates. Large purchases of batteries are reported for naval service and for industrial truck operation. Deliveries on batteries are very fair, four weeks being a normal quotation. Electric delivery wagons for laundry service are growing in popularity in some of the smaller cities of New England. In the automobile battery field (gasoline cars) business is spotty. Recently a number of 6-volt outfits have been sold by a Springfield (Mass.) dealer for the lighting of country churches in locations remote from central station service.

LAMPS.—A decided shortage is apparent in miniature lamps for automobiles, due to government orders. An order for 10,000 such lamps was placed a few days ago for gun-sight service. Carbon lamps are also scarce, and the prospects are that there will be a scarcity in many other lines soon. The domestic demand for lamps has doubled and the foreign demand has increased sevenfold in the last year, according to one large jobber. Prices are holding firm.

POLE-LINE HARDWARE.—A shortage is noted here, although the present demand is reported to be slackening.

CONTROLLING APPARATUS.—Government orders are booming sales. Insulating material used in motor starters is scarcer, and deliveries are accordingly made more difficult.

AUTOMOBILE STARTERS.—Sales are falling off somewhat, due to a decrease in car sales. "Closed-Car Week" at Boston did not stimulate purchases as much as some dealers expected.

MOTOR-DRIVEN FARMING MACHINERY.—Great interest is being shown in this auxiliary branch of the electrical application field, and at the recently opened Eastern States Agricultural Exposition in Springfield, Mass., an active campaign is on to develop more popular appreciation of the benefits of electricity on the farm through exhibits and manufacturing representation.

ELECTRIC RADIATORS.—Stocks are practically exhausted; prices are holding firm, and the shortage of sheet steel is impeding production.

ATLANTA

All sources report business as being excellent. Jobbers and dealers state that the volume of sales in nearly all lines continues heavy, with an increasing activity in seasonal goods due to the advent of brisk fall weather, which arrived earlier this year than was expected.

The cantonments have stimulated a demand for all electrical specialties such as the men are permitted to use in the barracks.

The Blue Ridge Power Company, Spartanburg, S. C., has placed contracts covering equipment for its development on the Green River near Saluda, S. C., which include two 2500-kw. vertical units with Pelton waterwheels, transformers and station equipment. It is proposed to convey water to the power house, a distance of one mile, using an 8-in. wooden flume. Energy will be transmitted to Spartanburg.

STORAGE BATTERIES.—Branch offices and service stations of the various manufacturers report a large volume of business; in fact, more than they can conveniently take care of. Sales in certain quarters are reported as being more than 100 per cent better to date than last year. Deliveries, however, do not seem to be improving.

ELECTRICAL INDUSTRIAL TRUCKS.—More activity seems to be developing in this line, as reflected by a number of substantial orders being placed. One large fertilizer manufacturer lately purchased eighteen 2-ton trucks, to be

utilized mostly in the shipping departments of its various branch factories. A few scattered orders have also been placed by the government for the movement of supplies in the quartermaster depots. The present scarcity of labor in this section is directing the attention of many industrial interests to this type of labor-saving equipment, which should tend further to stimulate this line and open up a good future market.

INDUSTRIAL CONTROL DEVICES.—The manufacturers of these devices have enjoyed a good market in the Southeast for 1917. Estimates place sales to date as registering an increase of 40 per cent over 1916. Deliveries have been very poor, and the prospects are that they will be worse.

SERIES INCANDESCENT SYSTEMS.—Manufacturers state that the demand in this line has been very strong, and sales are double those of last year. Shipments to date have been good; delivery promises run from six to eight weeks.

POTENTIAL REGULATORS.—Demand for both feeder and generator voltage regulators is very strong. Shipments on the generator type are much better than on the feeder type. The former are promised for two months, as against three to four months for the latter.

CABLE.—Requirements of this section for 1917 have shown an average of 60 per cent increase over 1916. The demand continues steady for the heavy sizes, but the deliveries are very discouraging.

HEATING APPLIANCES.—Jobbers report an unprecedented volume of sales for most of the household devices during the past week.

LIGHTING FIXTURES.—The building of residences and apartments in Atlanta's burnt section has begun in earnest and is reflected in a big business in fixtures. Dealers report this year's volume of sales as being a record breaker.

POLES AND LINE MATERIAL.—The central stations are still experiencing considerable difficulty in securing poles for rush work. This is probably due to the rural sources holding for a price advance. Reports from certain sections indicate a slight improvement in hardware deliveries.

SEATTLE

A noticeable decrease in sales is noted during the past week. This applies particularly to sales of motors, wire, and on conduit supplies to shipyards, especially those engaged in steel ship construction. An authority in the electrical industries states that during the last week sales to shipyards dropped off 50 per cent, this being due to a strike in the shipbuilding plant. There was no decided increase in prices, and dealers expect no increase, believing the peak has been reached. Stocks are low and in certain lines they are exceedingly hard to obtain. This applies particularly to lamps and large sizes of rubber-covered wire. Stocks on lamps and wire are very low.

Standard lines, such as conduit, porcelain, small motors used by shipyards and household appliances, are coming through satisfactorily. The feature of the week's business was the continued heavy sales of domestic appliances, including washing machines, ranges, heaters, toasters and devices introduced and pushed by a campaign to lighten the home work. The sale of house-wiring devices was very light. There is practically no building under way or projected.

Freight conditions in Washington are reported satisfactory. Oregon, however, is complaining of a shortage of cars.

Fall business, from present indications, will not be so heavy as expected. The authorities believe the last three months of the year will show a falling off, as compared with the first nine months. The lumber mills and the government bought more heavily last week than in the week previous. Business from the mills is expected to increase, and projected buildings at the American Lake cantonment and Fort Stevens, Ore., mean new business in wiring devices.

The sawmills production continued approximately 75 per cent of normal, according to reports from 137 representative mills in Oregon and Washington. The indications point to an increased demand from the mills when all resume activities. The aircraft division of the army has placed an order for 10,000,000 ft. of selected fir to be distributed among the Washington mills, and a Philadelphia shipbuilding plant an order for 8,000,000 ft. of lumber, with the fir emergency committee, to be distributed among the Oregon and Washington mills.

Approximately 7000 shipyard employees in three fields and twelve wooden yards in Portland who have been on strike have agreed to accept the findings of the federal labor adjustment board, which opened its session in Portland Oct. 14. The Metal Trades Union, representing 9000 metal trade workers, balloted in Seattle Oct. 15 on the question of returning to work under temporary agreements. Oct. 20, midnight, is time set for the coast-wide strike of 6000 telephone operators, linemen and electricians, employees of the Pacific Telephone & Telegraph Company.

Credits and collections for the last week were satisfactory.

CABLE.—Government demand was heavy during the last week. Prices are steady.

MOTORS.—There is heavy demand from the government and a normal demand from the lumber mills and industrial plants. Prices are about the same. Shipment is very slow.

FARM LIGHTING SETS.—The campaign for farm lighting outfits is justified in the Northwest. A continued interest is shown and there is an increase in sales.

HEATING EQUIPMENT.—The Electric Sales Corporation, has recently closed a contract for installation of the Apfel system of electric heating in the new Paul High School at Paul, Idaho. Contract was awarded to the Apfel system, as a result of the satisfactory service the system gave last winter in the Caledonia Hotel at Rupert, Idaho.

SAN FRANCISCO

Conditions are better than in October last year, but at present indications are that less business will be done this month than in September. Very little building is under way, excepting that connected with the industrial plant extension and work incidental to war orders. An uncertainty in present market conditions exists, probably because the present quieting down is the first suggestion of having passed the peak of recent good business.

LAMP CORD.—This week it is quoted at $26.90 per 1000 ft. of No. 18 cotton-covered, which is lower than previously reported. Stocks are poor and deliveries very bad.

ELECTRIC HEATERS.—Unusual activity has been shown this fall and several companies are installing air heaters, with a considerable percentage of electric ranges. This movement is the more pronounced because coal in San Francisco now costs the householder about $14 per ton, and with oil high electric heating is more favorably regarded. Although 600 to 1500 watts are ordinary sizes, orders for sizes up to 3 kw. are being received.

ELECTRIC FANS.—The season is over and there is little demand for fans in California excepting in the warm weather; but fan orders have not yet been placed for ships under construction, which will mean considerable business.

TRANSFORMERS AND MOTORS.—Several power companies are making strenuous efforts to compensate the shortage of motors and transformers by taking out such equipment wherever not vitally needed and reinstalling it at critical points. With very high wages and a labor shortage this is an unsatisfactory method, but it is practically impossible to get motors and transformers in the larger sizes, and deliveries are promised only on very long terms.

SWITCHES.—The stock of knife switches is poor and deliveries are slow. Material for safety switches to be made up by Pacific Coast licensees is hard to get, and the stocks are extremely poor.

HOLIDAY TRADE.—Preparations are being made for a heavy Christmas trade. Already there is an active demand from agricultural regions, and more is anticipated after the payment for fall crops. This trade is calling especially for vacuum cleaners, washing machines and other labor-saving devices.

Current Prices of Electrical Supplies

NEW YORK AND CHICAGO QUOTATIONS

The prices quoted are those prevailing in standard packages or specified lots on apparatus and appliances in Eastern and Middle West markets at the beginning of business on Monday of last week. They are in all cases the net prices or prices subject to discounts from standard lists of contractors, central stations, dealers and others engaged in the resale of such goods.

Prices in Southern and other nearby markets will rule about the same as those in the Middle West, although slight modifications to cover increased freight and local demands should be expected. In the Far West and on the Pacific Coast the prevailing prices are naturally higher, covering as they must increased freight and the necessity of larger stocks with increased interest and warehouse charges on account of the distances from sources of supply, infrequent turnover of stock and uncertainty as to delivery of goods in transit. Moreover, the Far West presents a wide variation in demand due to a small population spread over a wide area in agricultural and mining communities, as contrasted with the denser population of the East and Middle West, their nearness to the source of supply, the more frequent turnover in stocks and the constant demands which arise in industrial centers.

The variation in prices may be due to the difference in grade of products made by different manufacturers, to local conditions, or to both.

ARMORED CONDUCTORS, FLEXIBLE STEEL

Single-Conductor

B. & S. Size	List, per 1000 Ft.
No. 14 solid	$61.00
No. 12 solid	71.00
No. 10 solid	90.00
No. 8 solid	106.00
No. 6 solid	145.00
No. 10 stranded	95.00
No. 8 stranded	115.00
No. 6 stranded	160.00
No. 4 stranded	205.00
No. 2 stranded	266.00
No. 1 stranded	315.00

Twin-Conductor

No. 14 solid	104.00
No. 12 solid	135.00
No. 10 solid	185.00
No. 8 stranded	235.00
No. 6 stranded	370.00
No. 4 stranded	575.00

NET PRICE PER 1000 FT.—NEW YORK

Single-Conductor

Less than coil	$61.00 to $71.00
Coil to 1000 ft	59.17 to 68.87

Twin-Conductor

Less than coil	$105.00 to $135.00
Coil to 1000 ft	70.00 to 130.95

DISCOUNT—CHICAGO

Single-Conductor

Less than coil	+10%
Coil to 1000 ft	—10%

Twin-Conductor

Less than coil	+10%
Coil to 1000 ft	—10%

ATTACHMENT PLUGS

List ranges from $0.22 to $0.30 each. Standard packages from 100 to 250.

DISCOUNT—NEW YORK

Less than 1/5 std. pkg	+10% to 12%
1/5 to std. pkg	10% to 20%
Std. pkg.	34% to 44%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg	+20% to 12%
1/5 to std. pkg	List to 20%
Std. pkg.	30% to 44%

BATTERIES, DRY

NEW YORK

Each Net	No. 6 Regular	No. 6 Ignitor
Less than 12	$0.40	$0.40
12 to 50	.35	.35
50 to barrel	.31	.32
Barrel lots	.28	.29

BATTERIES, DRY—Continued

CHICAGO

Each Net	No. 6 Regular	No. 6 Ignitor
Less than 12	$0.40	$0.40
12 to 30	.35	.35
50 to barrel	.31 to .3175	.32 to .3275
Barrel lots	.28 to .2875	.29 to .2975

CONDUIT, METALLIC FLEXIBLE

Size, In.	Ft. Per Coil	List, Per 100 Ft.
5/16	250	$5.00
3/8	250	7.50
1/2	100	10.00
3/4	50	13.00
1	50	21.00
1 1/4	50	26.00
1 1/2	25–50	35.00
2	25–50	45.00
2 1/2	25–50	52.00

NET PER 1000 FT.—NEW YORK

	Less Than Coil	Coil to 1000 Ft.
3/8-in. single strip	$75.00	$69.75
3/8-in. double strip	75.00	72.00
1/2-in. single strip	100.00	93.00
1/2-in. double strip	100.00	96.00

NET PER 1000 FT.—CHICAGO

	Less Than Coil	Coil to 100 Ft.
3/8-in. single strip	$75.00	$63.75
3/8-in. double strip	78.75	71.25
1/2-in. single strip	100.00	85.00
1/2-in. double strip	105.00	85.00–95.00

CONDUIT, NON-METALLIC FLEXIBLE

Size, In.	List Per Foot	Size, In.	List Per Foot
7/32	$0.05 1/2	1	$0.25
1/4	.06	1 1/4	.33
3/8	.09	1 1/2	.40
1/2	.12	1 3/4	.47
5/8	.15	2	.55
3/4	.18	2 1/4	.65

NET PER 1000 FT.—NEW YORK

	Less Than $15 List	$15 to $60 List	$60 to $150 List
7/32-in.—$55.00		$24.50	$21.50
1/4-in.—60.00		27.00	23.50

NET PER 1000 FT.—Chicago

	Less Than $15 List	$15 to $60 List	$60 to $150 List
7/32-in.—$36.67-$55.00		$27.50	$23.10-$24.75
1/4-in.—$40.00-$60.00		$30.00	$25.20-$27.00

CONDUIT, COUPLINGS AND ELBOWS. RIGID IRON

Card No. 38

Size, In.	Conduit, List per Foot
1/4	$0.08 1/2
3/8	.08 1/2
1/2	.08 1/2
3/4	.11 1/2
1	.17
1 1/4	.23
1 1/2	.27 1/2
2	.37
2 1/2	.58 1/2
3	.76 1/2

	Couplings, List	Elbows, List
1/4	$0.05	$0.19
3/8	.06	.19
1/2	.07	.19
3/4	.10	.25
1	.13	.37
1 1/4	.17	.45
1 1/2	.21	.60
2	.28	1.10
2 1/2	.40	1.80
3	.60	4.80

DISCOUNT—NEW YORK

	1/4 in. to 1/2 in.	3/4 in. to 3 in.
Less than 2500 lb.	6%	8%
2500 to 5000 lb.	9%	11%

(For galvanized deduct six points from above discounts.)

DISCOUNT—CHICAGO

	1/4 in. to 1/2 in.	3/4 in. to 3 in.
Less than 2500 lb.	3.8%	5.8%
2500-5000 lb.	6.8%	8.8%

(For galvanized deduct six points from above discounts.)

FLATIRONS

NEW YORK

List price	$5.00
Discount	30%

CHICAGO

List	$5.00 to $6.00
Discount	25%

FUSES, INCLOSED

250-Volt	Std. Pkg.	List
3-amp. to 30-amp.	100	$0.25
35-amp. to 60-amp.	100	.35
65-amp. to 100-amp.	50	.90
110-amp. to 200-amp.	25	2.00
225-amp. to 400-amp.	25	3.60
450-amp. to 600-amp.	10	5.50
600-Volt		
3-amp. to 30-amp.	100	$0.40
35-amp. to 60-amp.	100	.60
65-amp. to 100-amp.	50	1.50
110-amp. to 200-amp.	25	2.50
225-amp. to 400-amp.	25	5.50
450-amp. to 600-amp.	10	8.00

DISCOUNT—NEW YORK

Less than 1/5 std. pkg.	28%
1/5 to std. pkg.	38%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg.	28%
1/5 to std. pkg.	38%

FUSE PLUGS

3-Amp. to 30-Amp.

NEW YORK.

	Per 100 Net
Less than 1/5 std. pkg.	$5.75
1/5 to std. pkg.	4.50

Standard package, 500. List, each, $0.07.

CHICAGO

	Per 100 Net
Less than 1/5 std. pkg.	$6.25
1/5 to std. pkg.	5.25

Standard package, 500. List, each, $0.07.

LAMPS, MAZDA

105 *to* 125 *Volts*

Regular, clear:	Std. Pkg.	List, Each
10 to 40-watt—B	100	$0.27
60-watt—B	100	.36
100-watt—B	24	.65
75-watt—C	50	.65
100-watt—C	24	1.00
200-watt—C	24	2.00
300-watt—C	24	3.00
Round bulbs, 3½ in., frosted:		
15-watt—G 25	50	.50
25-watt—G 25	50	.50
40-watt—G 25	50	.50
Round bulbs, 3¾ in., frosted:		
60-watt—G 30	24	.72
Round bulbs, 4⅝ in., frosted:		
100-watt—G 35	24	1.05

DISCOUNT—NEW YORK

Less than std. pkg.	Net
Std. pkg.	10%

DISCOUNT—CHICAGO

Less than std. pkg.	Net
Std. pkg.	10%

LAMP CORD

Cotton-Covered, Type C, No. 18

NEW YORK

	Per 1000 Ft. Net
Less than coil (250 ft.)	$34.88
Coil to 1000 ft.	26.52

CHICAGO

	Per 1000 Ft. Net
Less than coil (250 ft.)	$36.56 to $36.88
Coil to 1000 ft.	27.42 to 27.66

LAMP GUARDS, WIRE

Standard packages from 50 to 150.

NEW YORK

Net per 100	$20.00 to $29.00

CHICAGO

Net per 100	$14.58 to $38.35

OUTLET BOXES

Nos.	List, per 100
101—A. A1½, 4 S.C., 6200, 320	$30.00
102—B.A., 6200 S.E., 300, AX, 1½, 4 S	30.00
103—C.A., 9, 4R, B 1½	25.00
106—F.A., 7, C.S. 1½, 3 R	20.00

DISCOUNT—NEW YORK

	Black	Galvanized
Less than $10.00 list	List	List
$10.00 to $50.00 list	42%	37%

DISCOUNT—CHICAGO

	Black	Galvanized
Less than $10.00 list	40%	35%
$10.00 to $50.00 list	50%	45%

PIPE FITTINGS

DISCOUNT—NEW YORK

Less than 1/5 std. pkg.	10%
1/5 to std. pkg.	20%
Std. pkg.	30%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg.	10%
1/5 to std. pkg.	20%
Std. pkg.	30%

PORCELAIN CLEATS—UNGLAZED

2 and 3 Wire

NEW YORK

	Per 1000 Net
Less than 1/5 std. pkg.	$20.00
1/5 to std. pkg.	15.00

Standard package, 2200 List per 1000, $20.

CHICAGO

	Per 1000 Net
Less than 1/5 std. pkg.	$15.80 to $20.54
1/5 to std. pkg.	13.00 to 19.24

Standard package, 2200 List per 1000, $20.

PORCELAIN KNOBS

NEW YORK

Per 1000 Net	Std. Pkg. 3500	Std. Pkg. 4000
	5½ N.C.—Solid Nail-it—N.C.	
Less than 1/5 std. pkg.	$24.30	....
1/5 to std. pkg.	12.15	....

CHICAGO

Per 1000 Net	Std. Pkg. 3500	Std. Pkg. 4000
	5½ N.C.—Solid Nail-it—N.C.	
Less than 1/5 std. pkg.	$11.85 to $18.00	$20.75 to $30.75
1/5 to std. pkg	9.00 to 11.10	16.30 to 24.20

SOCKETS AND RECEPTACLES

	Std. Pkg.	List
⅛-in. cap key and push sockets	500	$0.33
⅛-in. cap keyless socket	500	.30
⅛-in. cap pull socket	250	.60

DISCOUNT—NEW YORK

Less than 1/5 std. pkg.	Net
1/5 to std. pkg.	20%

DISCOUNT—CHICAGO

Less than 1/5 std pkg.	Net
1/5 to std. pkg.	15%

SWITCHES, KNIFE

250-Volt, Front Connections, No Fuse

High Grade:	
30-amp. S. R. S. T.	$0.80
60-amp. S. P. S. T.	1.20
100-amp. S. P. S. T.	2.25
200-amp. S. P. S. T.	3.48
300-amp. S. P. S. T.	5.34
30-amp D. P. S. T.	1.20
60-amp. D. P. S. T.	1.78
100-amp. D. P. S. T.	3.38
200-amp. D. P. S. T.	5.20
300-amp. D. P. S. T.	8.00
30-amp. 3 P. S. T.	1.80
60-amp. 3 P S. T.	2.68
100-amp. 3 P. S. T.	5.08
200-amp. 3 P. S. T.	7.80
300-amp. 3 P. S. T.	12.00
Low Grade:	
30-amp. S P. S. T.	0.42
60-amp. S. P. S. T.	0.74
100-amp. S. P. S. T.	1.50
200-amp. S. P. S. T.	2.70
30-amp. D. P. S. T.	0.68
60-amp. D. P. S. T.	1.22
100-amp. D. P. S. T.	2.50
200-amp. D. P. S. T.	4.50
30-amp. 3 P. S. T.	1.02
60-amp. 3 P. S. T.	1.84
100-amp. 3 P. S. T.	3.76
200-amp. 3 P. S. T.	6.76

DISCOUNT—NEW YORK

Less than $10 list	+5% to 5%
$10 to $25 list	11% to 16%
$25 to $50 list	14% to 24%

DISCOUNT—CHICAGO

Less than $10 list	+5% to 5%
$10 to $25 list	11% to 16%
$25 to $50 list	14% to 24%

SWITCHES, SNAP AND FLUSH

5-Amp. and 10-Amp., 125-Volt Snap Switches

	Std. Pkg.	List
5-amp. single-pole	250	$0.28
5-amp. single-pole, ind.	250	.32
10-amp. single-pole	100	.48
10-amp. single-pole, ind.	100	.54
5-amp. three-point	100	.54
10-amp. three-point	50	.76
10-amp., 250-volt, D. P.	100	.66

SWITCHES, SNAP AND FLUSH—Cont'd

10-Amp. 250-Volt Push-Button Switches

	Std. Pkg	List
10-amp. single-pole	100	$0.45
10-amp. three-way	50	.70
10-amp. double-pole	50	.70

DISCOUNT—NEW YORK

Less than 1/5 std. pkg.	Net
1/5 to std. pkg.	15%
Std. pkg.	28%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg.	+20% to net
1/5 to std. pkg.	Net to 15%
Std. pkg.	30%

SWITCH BOXES, SECTIONAL CONDUIT

Union and Similar—	List, Each
No. 155	$0.34
No. 160	.60

DISCOUNT—NEW YORK

	Black	Galvanized
Less than $2.00 list	List	..
$2.00 to $10.00 list	20%	..
$10.00 to $50.00 list	30%	..

DISCOUNT—CHICAGO

	Black	Galvanized
Less than $2.00 list	25% to 50%	15% to 40%
$2.00 to $10.00 list	25% to 50%	20% to 40%
$10.00 to $50.00 list	25% to 64%	20% to 52%

TOASTERS, UPRIGHT

NEW YORK

List price	$6.00
Discount	30%

CHICAGO

List price	$4.50 to $5.00
Discount	25% to 30%

WIRE, ANNUNCIATOR

NET PRICE—NEW YORK

No. 18, less than full spools	$0.49
No. 18, full spools	0.45

CHICAGO

	Per Lb. Net
No. 18, less than full spools	$0.65 to $0.6585
No. 18, full spools	0.55 to 0.5585

WIRE, RUBBER-COVERED, N. C.

Solid-Conductor, Single-Braid

NEW YORK

	Price per 1000 Ft. Net		
No.	Less than 500 Ft.	500 to 1000 Ft.	1000 to 5000 Ft.
11	$18.00	$14.00	$11.25
12	27.51	23.58	19.85
10	38.43	32.94	27.45
8	54.39	46.62	38.85
6	86.10	73.80	61.50

CHICAGO

	Price per 1000 Ft. Net		
No.	Less than 500 Ft.	500 to 1000 Ft.	1000 to 5000 Ft.
14	$18.00	$16.00	$14.00
12	27.79-28.63	23.82-24.54	19.85-22 50
10	34.44-38.78	30.47-31.57	27.70-28.70
8	48.84	43.13-44.77	39.20-40.70
6	68.25-70.80	62.05-64.00	55.85-57.60

WIRE, WEATHERPROOF

Solid-Conductor, Triple-Braid, Size 4/0 *to* 8 *Inc.*

NEW YORK

	Per 100 Lb. Net
Less than 25 lb.	$37.25
25 to 50 lb.	36.25
50 to 100 lb.	35.25

CHICAGO

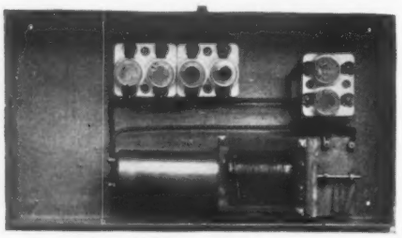
	Per 100 Lb. Net
Less than 25 lb.	$40.35to $42.00
25 to 50 lb.	39.35 to 41.00
50 to 100 lb.	28.35 to 40.00

NEW APPARATUS AND APPLIANCES

A Record of Latest Developments and Improvements in Manufacturers' Products Used in the Electrical Field

Sign Flasher

A sign flasher that eliminates all motor drive and complicated mechanism for flashing signs is made by the Automatic Electric Controller Company of Seattle, Wash. Essentially the device consists of a solenoid which actuates a stem. This stem is attached to an oil dashpot at the lower end which slows



NO MOTOR DRIVE IN THIS SIGN FLASHER

up its movements and permits of regulating speed of operation within wide limits. The upper end of the stem projects above the solenoid and operates the circuit breaker. This breaker controls the solenoid circuit only. The load circuit is made and broken under oil in the dashpot. These flashers are made in two stock sizes. The one illustrated is designed for loads up to 2500 watts alternating current or 1000 watts direct current any voltage. The next size will handle 5000 watts alternating current and 2500 direct current.

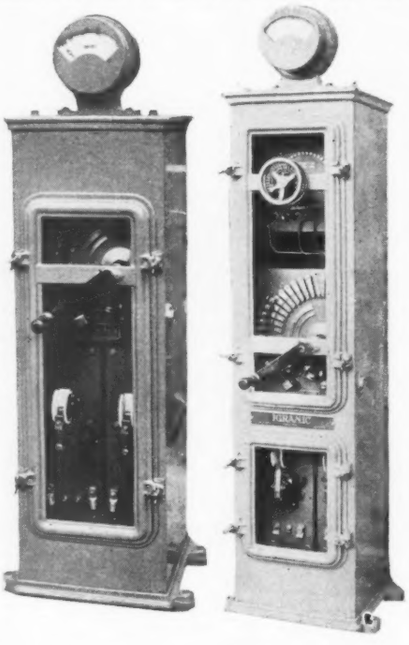
Motor-Controlling Panels

The Igranic Electric Company, Ltd., of 147 Queen Victoria Street, London, England, has recently developed the "Conspede" and "Varispede" motor-control panels.

The "Conspede" panels, which are for constant-speed motors, comprise a heavy-duty motor-starting switch with automatic no-voltage release and two single-pole magnetically operated clapper switches (used as circuit breakers) with automatic overload release. The starter is interlocked with the clapper switches. When the handle of the starter is moved in a clockwise direction (for the purpose of starting the motor) a roller turns so that the metal part of its periphery is in contact with the sectors on the face of the starter and the operating coils of the clapper switches are thereby excited, but if the handle be moved ever so slightly in an anti-clockwise direction, the roller is turned so that the porcelain or insulating portion of its periphery comes into contact with the sectors and the circuit to the operating coils of the clapper switches is thereby opened.

The "Varispede" panel comprises (in addition to what has already been described) a shunt-field regulator so interlocked with the starter that it is always short-circuited during the starting operation, thus insuring the motor full field strength at starting.

Both of the panels are inclosed in what are called pillar-type housings, which effectually protect the switch gear from damage and which are suitable for installation in any convenient position on the floor of an engineering or other workshop. Each panel has a cast-iron base with feet suitable for bolting to the floor. The whole of the switch gear is built on a strong pipe frame supported from this base. The top of the housing consists of a massive cast-iron crown, and between the crown and base the



TYPES OF MOTOR-CONTROLLING PANELS

housing is of heavy-gage wrought iron, the top and bottom edges of which fit into grooves in the crown and base. This wrought-iron intermediate portion is fitted with glazed hinged cast-iron doors on the front, giving a good view of the switchgear inside, and with hinged cast-iron doors on the back, which give access to the resistances and interconnections. The cast-iron crown is secured by two nuts, screwed on to the upper end of the pipe frame, and this arrangement makes it easy, when more perfect access is required to the interior than is afforded by the doors, to lift off the crown and the whole of the rest of the housing from the base by removing these two nuts.

Steel-Guttered Cabinets

Two types of steel-guttered cabinets, one for surface and the other for flush mounting, are made by the Aurora Steel Products Company of Aurora, Ill. The construction, it is pointed out, makes it possible to furnish these cabinets with either 2-in., 3-in. or 4-in. (5-cm., 7.6-cm. or 10-cm.) wiring gutter, entirely covered by the front of the cabinet. The cabinets are made of 14 and 16 gage steel in various sizes and depths varying from 3 in. to 12 in. (7.6 cm. to 30.5 cm.).

Pony-Type Snap Switches

Pony-type snap switches are being made by the General Electric Company, Schenectady, N. Y., with the standard pony size base, but equipped with porcelain covers and handles so that the switches can be used in exposed places where they are liable to be subjected to corroding influences from the weather.

These new snap switches are made in single-pole, 3-amp., 250-volt, 5-amp., 125-volt sizes, with both closed and slotted bases, as desired, and in indicating or non-indicating types.

Adjustable Floor Lamp

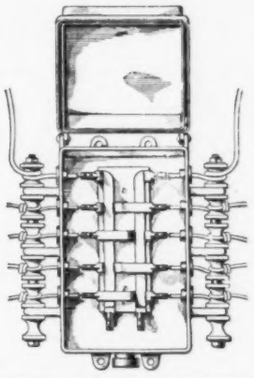
The floor lamp shown in the accompanying illustration is made in either verde antique or statuary bronze and is offered to the trade by the Western Electric Company of New York. The reflector may be adjusted to any angle. The lamp is equipped with a split ball joint which will not cut the cord, a

REFLECTOR MAY BE ADJUSTED TO ANY ANGLE

thumb screw that fits the finger and a locking-device cushion grip which prevents scratching of the brass tubing. The diameter of the base is 8¼ in. (21 cm.) and it is heavily weighted to prevent upsetting. This lamp is also made in the table portable type.

Distribution Box

The Canton Specialty Company of Canton, Ill., has placed on the market a distribution box for use on overhead construction in districts where more than one customer's service lead is taken from a distribution pole. The



CAST-IRON BOX WITH SLATE BASE

box itself is of light cast iron, approximately 15 in. long, 8 in. wide and 5 in. (38.1-cm. by 20.3-cm. by 12.7-cm.) deep. The lid hinges at the top and is fitted with a felt gasket to make the box approximately watertight. Inside the box is a slate base upon which are mounted two busbars carrying lugs to which the customers' service wires are extended through porcelain thimbles in the side of the box. In practice the secondary lines are connected to these busbars, and the service lines radiate from them to the customers' premises, the strain being taken by distribution racks attached to the side of the box.

Air-Pressure Relay

An indicator for use in connection with air-cooled transformers, arranged to operate an audible alarm to notify operators of failure of air supply, has been developed by the Electrical Development & Machine Company of Philadelphia. This device consists of a cup-shaped metal base so arranged as

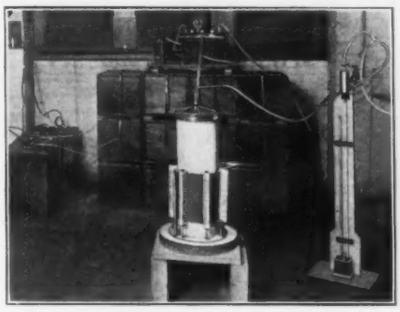
FOR USE WITH AIR-COOLED TRANSFORMERS

to provide for the free movement and support of a ground aluminum valve plate, which carries a post supporting a contact disk. The lower part of the metal base is arranged for screwing on a 2-in. (5.08-cm.) iron pipe. This pipe is used for the purpose of taking air pressure from the air chamber direct to the signal device.

The two contact points for closing the alarm circuit are arranged on the top of the casing, so that the disk, which is fastened to the aluminum valve post, will close the circuit properly when the pressure in the air chamber drops below a safe operating point. The contact points on top are protected by an oval glass cover. The operation of the device is such that the aluminum valve will rise and remain closed when any pressure over approximately ½ oz. (14 g.) is delivered in the air chamber.

High-Frequency Induction Furnace

A furnace which presents a radical departure from usual furnace practice and embodies the first employment of oscillatory currents for the generation of heat and production of temperature has been placed on the market by the Pyrolectric Instrument Company of Trenton, N. J. By reason of the highly effective induction possible



NO IRON IS USED IN THIS FURNACE

without the interlinkage of a magnetic with an electrical circuit, currents can be set up in the containing crucible in the case of a non-conducting melt, or in the melt itself if this melt has sufficient conductance to permit the flow of current. It is pointed out that no iron is used. Thus it is possible to raise the temperature of a melt in a crucible until its resistance becomes low enough to permit the generation of heat in the substance itself, after which the temperature producible is limited only by the durability of the insulation and refractory container.

Since this furnace operates by induction, conditions of the melting chamber may be controlled perfectly. Consequently it is possible to produce temperatures exceeding 1600 deg. C. in the partial vacuum or pressure, with any conceivable atmosphere, and if desired, without the contaminating influence of carbon.

The furnace works on a two-phase commercial circuit, 60 cycles, 220 volts, with balanced load at unity or slightly leading power factor. This furnace has been developed by Dr. E. F. Northrup of Princeton University in conjunction with the Pyrolectric Instrument Company, under the direction of the Ajax Metal Company of Philadelphia.

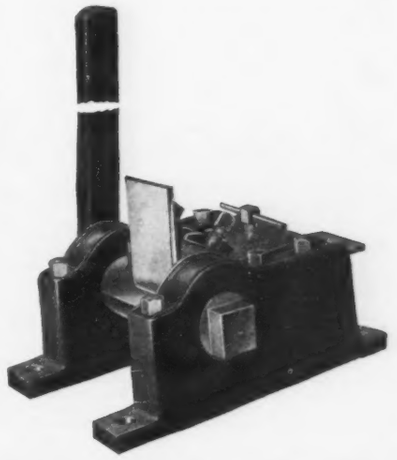
Electric Automobile Heater

An electric automobile heater which does away with the installation of a complete garage heating system is being manufactured by the Metal Specialties Company of Chicago. The heater is 12 in. (30.5 cm.) long, equipped with a handle at one end and a hook at the other. It hangs under the hood near the carburetor, engine and radiator, distributing the heat where it is most needed. It is furnished with 10 ft. (30.5 m.) of cord and an attachment plug for any electric light bracket. It is made for use on a 110-volt current, either direct or alternating. This device, the maker points out, prevents freezing to the cooling water in the motor car and facilitates starting on cold mornings at a cost decidedly lower than that of the garage heater.

Busbar-Bending Machine

A machine that bends equally well all copper bar sections up to and including 6 in. (15.2 cm.) in width and ⅜ in. (9.5 mm.) in thickness is here illustrated. The bar is run through the bed and clamped firmly in place. The operation of the bending arm causes a bending jaw to carry the bar end up to a true right angle or any inside angle more obtuse. The adjustable top-holding clamp may be set, allowing for a slight spring-back, so that with any one section of bar any number of right-angle bends may be reproduced by the complete travel of the operating lever.

The bending jaw does not roll or wipe the moving portion of the bar, but simply follows it through the bend. This feature prevents the possibility of the piece sliding through the machine bed after commencing the bend. By use of the gage face on the rear end of the machine any number of pieces



WILL BEND 6-IN. COPPER BAR SECTIONS

may be bent with proper allowance so that they will lie together evenly spaced in a stack after they have been bent.

This machine is manufactured by the General Devices & Fittings Company of Chicago.

Trade Publications

RESISTANCE UNITS.—The Wirt Company of Philadelphia has prepared a bulletin descriptive of its Di-El-Ite resistance units.

TABLE STOVES.—The Standard Stamping Company of Huntington, W. Va., has prepared a leaflet descriptive of its standard table stoves.

WASHING MACHINE. — The "1900" Washer Company of Binghamton, N. Y., has issued a bulletin descriptive of its "1900" gravity washer.

STEAM TRAPS.—The Fisher Governor Company, Marshalltown, Iowa, has prepared bulletin No. 1101, descriptive of its Fisher steam trap type No. 33.

GRAPHIC INSTRUMENTS.—The Esterline Company of Indianapolis, Ind., has prepared a bulletin which describes briefly the Esterline Graphic efficiency instruments.

PRESSURE PUMPS.—The Worthington Pump & Machinery Corporation, 115 Broadway, New York, has prepared a bulletin descriptive of its Worthington pot-valve pressure pump.

OPTICAL PYROMETER. — An optical pyrometer for factory use is described in bulletin 860, published by the Leeds & Northrup Company, 4901 Stenton Avenue, Philadelphia, Pa.

SELLING MEDIUM.—"Selfast," a device that displays goods in motion, is illustrated and described in a bulletin prepared by the Herberts Engineering Company, Inc., 10 East Forty-third Street, New York City.

METER EQUIPMENT. — Metropolitan protective service and meter equipment No. 3600 is illustrated and described in a bulletin prepared by the Metropolitan Engineering Company, 35 Vestry Street, New York City.

LAMPS FOR MOTION-PICTURE STUDIOS.—Bulletin No. 77, descriptive of Cooper Hewitt electric lamps for motion-picture studios, is being distributed by the Cooper Hewitt Electric Company of Hoboken, N. J.

COAL MINE EQUIPMENT.—"Tipple at Powhatan in Pocahontas Field" is the title of book No. 322, now being distributed by the Link-Belt Company of Chicago, Ill. This booklet is a reprint from *Coal Age*, May 26, 1917.

STORAGE-BATTERY LOCOMOTIVES. —The Ironton storage-battery locomotive, type D-1, for gathering and haulage in coal and metal mines and in industrial plants is described in bulletin No. 11, prepared by the Ironton Engine Company of Ironton, Ohio.

WIRES AND CABLES.—Paranite wires and cables are illustrated and described in a bulletin prepared by the Indiana Rubber & Insulated Wire Company of Jonesboro, Ind. This bulletin, which consists of 112 pages, gives information and prices on the complete line of wire cable made by this company.

MOTORS AND TRANSFORMERS.—Bulletin No. 41,021, descriptive of RF adjustable speed motors, has been prepared by the General Electric Company of Schenectady, N. Y. This company has also prepared bulletin No. 46,030, descriptive of its portable instrument transformers, types P2 and R2.

HEAT INSULATION.—The Magnesia Association of America has prepared a bulletin the title of which is "Let 85 per Cent Magnesia Defend Your Steam." This bulletin is a study of the cause and prevention of heat losses in the transmission of steam for power or heating purposes, addressed to the architect, engineer and owner.

HEATING DEVICES.—The General Electric Company of Schenectady, N. Y., has prepared bulletin No. 49,115A, descriptive of its industrial electric heating devices. These devices include air-tempering ovens for carbon and high-speed steels, melting pots for lead and tin alloys, oil-tempering bath and induction circulation water heaters.

REFLECTORS. — "Holophane Developments for Type 'C' Lamps" is the title of a new publication issued by the Holophane Glass Company, Inc., 340 Madison Avenue, New York City. It is a semi-technical treatise, in the form of a catalog, dealing with the newest lighting units which this company has designed for the type "C" lamp.

OIL FILTERS.—The Burt Manufacturing Company of Akron, Ohio, has prepared a bulletin descriptive of its oil filters, exhaust heads and ventilators. This bulletin includes information on the Cross, American and Warden oil filters, the Burt oil-filtering system, the Burt exhaust head, the Standard exhaust head, the Burt combination skylight and ventilator and the Burt rotary ventilator. It has 128 pages, is well illustrated and shows care in its make-up.

OXY-ACETYLENE PROCESS.—"Turning Waste Into Profit" is the title of a new book just issued by the Prest-O-Lite Company, Inc., of Indianapolis, Ind. It is devoted exclusively to the possibilities of reclaiming broken and worn machinery and metal parts for service by the oxy-acetylene process. Containing eighty-two illustrations, it pictures and describes representative examples of reclamation welding work in practically every field of the industrial world.

Trade Notes

THE LACLEDE-CHRISTY CLAY PRODUCTS COMPANY has moved its general office to Suite No. 1653, Railway Exchange Building, St. Louis.

THE WARD LEONARD ELECTRIC COMPANY of Mount Vernon, N. Y., is now represented in St. Louis, Mo., by the Morse Engineering Company.

CHARLES R. ABLETT, for many years New York representative of the Hygrade Lamp Company, has gone into business as the Charles R. Ablett Company, lamp specialists, 30 Church Street, New York City.

C. F. LOMONT until recently with the McGraw-Hill Publishing Company in Chicago, has become connected with the Electric Service Supplies Company, Philadelphia, as its representative in the North and Northwest, with headquarters in Minneapolis.

THE SOUTHWEST GENERAL ELECTRIC COMPANY, with offices at Dallas, Houston, San Antonio, El Paso, Oklahoma City and Tulsa, has recently taken the agency in its territory for the Consolidated Utilities Corporation of Chicago, manufacturer of Matthews farm lighting plants.

THE BROWN INSTRUMENT COMPANY, Pittsburgh, Pa., has purchased a large piece of ground lying to the south of its factory, which now extends along Wayne Avenue from Windrim Avenue on the north to Roberts Avenue on the south. This purchase will permit large extensions to the plans as may be required.

EDWARD D. McCORMACK has established an electrical brokerage business with offices in the Bank of Hamilton Building, Toronto, Can. Mr. McCormack, who was for many years manager of the Canadian General Electric Company, will execute commissions in connection with the buying or selling of electrical appliances and supplies, construction material, etc.

THE J. B. FERRY COMPANY, Cedar Rapids, Iowa, has arranged a slogan prize contest, opened during October, in connection with products which it handles. Ten prizes from merchandise will be awarded to contestants who send in the most nearly correct solutions to a set of trade-slogan puzzles contained, with instructions, in a special circular to be had on appplication. Any person connected with any central station or electrical firm is eligible to compete. Prizes will be awarded as soon after Nov. 1 as possible, and the names of the winners will be published.

THE VULCAN STEEL PRODUCTS COMPANY, New York City, has opened an office in Havana, Cuba, under the management of G. O. Simpson. In connection with this office there will be maintained a permanent exhibition of machinery and steel and iron products. Branches of the Vulcan company are now maintained at Paris, France; Hongkong and Shanghai, China; Yokohama, Japan; Milan, Italy; Barcelona, Spain; Melbourne and Sydney, Australia; San Juan, Porto Rico, and Singapore, Straits Settlements. It is also represented in all the world's important trade centers.

THE WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, East Pittsburgh, Pa., announces another increase in wages for its shop employees aggregating nearly $2,000,000 a year, effective Oct. 16. All employees observing shop hours, except munition workers, will receive an additional bonus of 10 per cent if they are on a salary or time-rate basis, and of 7 per cent if they are on a piece, premium or task basis. The 20,000 shop employees of the Westinghouse company form one of the most highly skilled organizations in the country. Wage increases granted since the outbreak of the European war now amount to about 60 per cent of the former average compensation.

New Incorporations

THE GREENWICH (CONN.) ELECTRIC COMPANY has been incorporated with a capital stock of $15,000 by Ralph Draughn, Raymond M. Boden and Charles W. Dewey.

THE TEXARKANA (ARK.) BATTERY COMPANY has been incorporated with a capital stock of $10,000 by G. H. Logan, William S. James and C. Ordeman, all of Texarkana.

THE STAMFORD (CONN.) ELECTRICAL CONTRACTING COMPANY has been chartered with a capital stock of $15,000 by Clifford Peck, Andrew D. Parker and Oren D. Maxim.

THE JOHNSON POWER TRANSMISSION COMPANY of Seattle, Wash., has been incorporated with a capital stock of $2,000 by William A. Blackwood, J. D. Johnson and Adair Rembert.

THE CONTINENTAL BATTERY COMPANY of Brooklyn, N Y., has been chartered by A. T. and J. M. McCafferty and E. Zeigler, 620 West 135th Street. The company is capitalized at $5,000.

THE RENARD-STARY ELECTRIC COMPANY of Los Angeles, Cal., has been incorporated with a capital stock of $25,000. The directors are: C. A. Renard, N. L. Starey and C. L. Chandler.

THE GARY (IND.) ELECTRIC COMPANY has been incorporated with a capital stock of $5,000 to deal in electrical fixtures. The incorporators are: Lloyd B. Snowden, Vaughn Snowden and David L. Snowden.

THE LALEY-OLIVER ELECTRICAL COMPANY of Fargo, N. D., has been incorporated with a capital stock of $25,000. The incorporators are: E. E. Oliver, M. A. Baldwin and C. W. McRoberts, all of Fargo, N. D.

THE ELECTRICAL CONTRACTORS' CORPORATION of Waterbury, Conn., has been incorporated with a capital stock of $1,000 by John H. Gilliland, Ralph J. Vaughan of Waterbury, and H. M. Whiting of Bradford.

THE NUNN ELECTRIC COMPANY of Oklahoma City, Okla., has been incorporated with a capital stock of $25,000 by J. E. Nunn of Amarillo, Tex.; O. T. Jenkins of Oklahoma City, Okla., and Galen Crow of Guthrie, Okla.

THE NEW HAVEN (CONN.) ELECTRIC COMPANY has been chartered by Raymond M. Boden, Harvey L. Voshell and Clifford A. Peck. The company is capitalized at $60,000 and proposes to do a general electrical business.

THE AUTOMATIC SIGNAL & SIGN COMPANY of Canton, Ohio, has been incorporated with a capital stock of $10,000 to manufacture signals. P. G. Myers is president of the company and John A. Wertz is secretary and treasurer.

THE ELECTRIC CONTRACTING & SUPPLY COMPANY of New London, Conn., has filed a certificate of organization at the office of the Secretary of State. The company is capitalized at $15,000. The incorporators are John E. Gill, Clifford Peck and Charles W. Dewey.

THE ELECTRIC SERVICE & POWER EQUIPMENT COMPANY of Grand Rapids, Mich., has been chartered with a capital stock of $11,000 by William G. Brummeler, 18 Lafayette Avenue, S. E.; Joseph Brown, 510 Wealthy Avenue, S. E., of Grand Rapids, and D. R. McDuffee of Saginaw.

THE CUMANU LIGHT & POWER COMPANY of New York, N. Y., has filed articles of incorporation under the laws of the State of Delaware with a capital stock of $50,000 to build and operate power plants. The incorporators are: Arthur W. Britton, Samuel B. Howard and Joseph F. Curtin.

THE DALLAS (Tex.) POWER & LIGHT COMPANY has been incorporated with a capital stock of $150,000 by Harry M. Durning of New York, N. Y.; J. F. Strickland, W. D. Head and C. F. Calder of Dallas. The company proposes to operate and maintain street car and interurban railway lines.

THE PACIFIC ELECTRO METALS COMPANY of Bay Point, Cal., has been incorporated by P. B. Ellis, Joseph Smyth, A. McCharles, J. H. Stern and William Muller. The company is capitalized at $100,000 and proposes to acquire and maintain mills, smelting and reduction plants. Carson City, Nev., is given as the principal place of business.

New England States

MANCHESTER, N. H.—The Manchester Traction, Light & Power Company has awarded a contract to Whitcomb & Kavanaugh, 6 Beacon Street, Boston, Mass., for the erection of a new power station.

BURLINGTON, VT.—The City Council has granted the Burlington Light & Power Company permission to erect electric transmission lines in certain streets of the city to transmit electricity from its plant at the gorge (so called) to the works of the Vermont Milk Chocolate Company.

RUTLAND, VT.—The Rutland Railway, Light & Power Company has been awarded a contract by the Patch Manufacturing Company to furnish energy (335 hp.) at the plant of the latter. The Rutland company will also erect immediately a new electric transmission line from Castleton Corners to Hampton, a distance of about 6 miles, to furnish electricity to the Staso Milling Company. The contract calls for 2400 hp.,

BOSTON, MASS.—An agreement has been reached between the Boston Elevated Railway Company and the Massachusetts Waterways Commission whereby a connection will be built between the new South Boston Fish Pier and the Boston Elevated Railway, work on which will begin at once. The proposed line will be constructed by the commission and leased to the railway company.

BROCKTON, MASS.—The Hub Gore Company has awarded a contract to the Tremaine Electric Company, School Street, for equipping its new plant on North Warren Avenue for electrical operation.

NEW BEDFORD, MASS.—The J. C. Rhodes Company is contemplating the construction of an addition to power house, 20 ft. by 40 ft., at its plant at 128 Front Street, to cost about $10,000.

BRISTOL, CONN.—The Chamber of Commerce is considering plans for the installation of an ornamental lighting system in the business district. The Bristol & Plainville Tramway Company has the contract for street-lighting.

HARTFORD, CONN.—Contract has been awarded by the Connecticut Steel Company for a one-story addition, 101 ft. by 195 ft., to its plant.

Middle Atlantic States

BATAVIA, N. Y.—Arrangements are being made by the City Council for using Niagara power for operating the municipal street-lighting system during the present shortage of coal.

BROOKLYN, N. Y.—The Public Service Commission has awarded the contract for the completion of construction and station finish in the Fourth Avenue Subway and the Center Street loop subway to D. C. Serber, at $69,084.

BROOKLYN, N. Y.—Plans have been prepared by the New York Municipal Railway Corporation, 85 Clinton Street, for the erection of new signal towers, circuit-breaker houses, etc., at its Coney Island terminal. W. S. Menden is chief engineer of the company.

BINGHAMTON, N. Y.—The Binghamton Light, Heat & Power Company has been awarded a contract by the United Shoe Machinery Company for furnishing electricity at the plant of the latter. The installation to include two large electric welders, 30 arc furnaces, 45 hp. in motors and one 10-kw. tempering bath. The power company has recently put its new plant in operation, which is now supplying electricity to the western portion of its territory.

BROOKLYN, N. Y.—Bids will be received at the office of the Mayor, City Hall, borough of Manhattan, until Oct. 24 for the installation of a single unit lighting system in drill shed, etc., Fourteenth Infantry Armory, Eighth Avenue and Fifteenth Street, Brooklyn; also for installation of a new lighting system in the Forty-seventh Infantry Armory, Marcy Avenue and Hayward Street, Brooklyn. Blank forms and other information may be obtained at the office of the Armory Board, Room 6, basement, Hall of Records, borough of Manhattan.

BUFFALO, N. Y.—The Lehigh Valley Railroad Company is planning to build a boiler house at its shops, to cost about $26,000, at South Ogden and Dingens Streets, and also a boiler house, machine shop, blacksmith shop and storehouse, at a cost of about $50,400, at the foot of Tifft Street.

DUNKIRK, N. Y.—The Atlas Crucible Steel Company is considering extensions to its plant, including the construction of a new transformer station.

Construction

News of Projects, Plans, Bids and Contracts. Notes on Work Under Way

NEW YORK, N. Y.—Plans have been prepared for the construction of an addition, 25 ft. by 85 ft., one story, to the power plant of the New York Edison Company, at 666 First Avenue, to cost about $7,000.

NEW YORK, N. Y.—The Ice Manufacturing Company, 1480 Broadway, is contemplating the construction of a new transformer station. Plans are being prepared by Mortensen & Company, 405 Lexington Avenue, architects and engineers.

OLEAN, N. Y.—Plans are being prepared by the Board of Water Supply for the construction of a new pumping station in connection with its proposed new filtration plant. The new plant will have a capacity of 2,500,000 gallons per day and will cost complete about $75,000. William Sheehan is commissioner.

PRINCE BAY, S. I., N. Y.—The S. S. White Dental Company is considering extensive improvements in its power station, to cost about $11,000.

ROCHESTER, N. Y.—Plans have been prepared by the General Railway & Signal Company for the erection of a power house at its works in Lincoln Park. E. E. Jackson is manager.

CALDWELL, N. J.—Plans are being considered by the township committee for the installation of a new street-lighting system on the Fairfield Road. This thoroughfare is about 6 miles long.

CAMDEN, N. J.—Plans are being prepared for the erection of a new power house for R. M. Hollingshead at 112 North Ninth Street.

GIBBSTOWN, N. J.—The installation of an electric-lighting system in Gibbstown is under consideration.

IRVINGTON, N. J.—Permit has been granted to the Irvington Manufacturing Company, 124 Coit Street, Irvington, for the construction of an addition to its power plant.

PERTH AMBOY, N. J.—Arrangements have been completed, it is reported, by the Public Service Electric Company for the installation of a new steam turbine, condenser, generator and auxiliary apparatus at its local power station.

TRENTON, N. J.—The City Commission is considering the installation of an electric street-lighting system from Calhoun Street to the Log Basin.

ASHLEY, PA.—Extensive improvements are being made to the local shops of the Central Railroad of New Jersey, including extensions to the power plant.

BEAVER CITY, PA.—When the present street-lighting contract expires, which is not until next year, a new lighting system will be installed. It is proposed to replace the arc lamps now in use with incandescent lamps, to be erected on the curb instead of the center of the street.

CHELTENHAM, PA.—Contract has been awarded by the Hoffman, DeWitt & McDonough Company to the William Linker Company, 331 Cherry Street, Philadelphia, for the construction of a new power house, 52 ft. by 60 ft., one story, at its local plant.

ERIE, PA.—The General Electric Company is planning to build a large power house in connection with its proposed plant in Erie.

GIRARDVILLE, PA.—The Borough Council has awarded the Schuylkill Light, Heat & Power Company of Centralia a contract to furnish electricity to operate its street-lighting system.

GREENSBURG, PA.—Revised plans are being prepared by Paul Bartholomew for the construction of a new power house, 55 ft. by 65 ft., to cost about $30,000, for the Westmoreland County officials.

HALIFAX, PA.—The Millersburg (Pa.) Electric Light, Heat & Power Company has begun work on the installation of a new electric street-lighting system in Halifax.

MARIETTA, PA.—The Pennsylvania Railroad Company, it is reported, is contemplating the installation of a large electric crane, etc., at its local freight yards.

MONT ALTO, PA.—Electricity to operate the new electric street-lighting system, to be installed at once by the borough officials, will be furnished by the Waynesboro Electric Light & Power Company.

PHILADELPHIA, PA.—The Philadelphia Suburban Gas & Electric Company is erecting a new electric transmission line from Phoenixville to Black Rock.

PHILADELPHIA, PA.—Bids will be received by the Department of Public Safety for lighting the streets of the city for a period of one year from Jan. 1 to Dec. 31, 1918.

PHILADELPHIA, PA.—Contract has been awarded by the Philadelphia Felt Company for the construction of an addition to its power house at its plant on Frankford Creek.

PHILADELPHIA, PA.—Plans have been prepared by the Pennsylvania Railroad Company for the construction of an addition, 25 ft. by 50 ft., to the power house at its West Philadelphia shops, to cost about $7,000.

PHILADELPHIA, PA.—The Philadelphia Electric Company has awarded a contract to Fred A. Havens & Company, 845 North Nineteenth Street, Philadelphia, for construction of addition to its power station "R" on Kensington Avenue, to cost about $20,000.

PHILADELPHIA, PA.—The Unit Construction Company has awarded a contract to John N. Gill & Company, Otis Building, Philadelphia, for the construction of a new power house at its new plant to be erected at Fifty-seventh and Gray Avenues, at a cost of about $83,000.

PHILADELPHIA, PA.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until Oct. 22 for the construction of a dispensary building, including electrical work, at the navy yard, Philadelphia. Drawings and specifications (No. 2557) may be obtained upon application to the above bureau or to the commandant of the navy yard named.

PHILADELPHIA, PA.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until Oct. 29 for electric wiring and lighting systems for the foundry and machine and electric shop at the navy yard, Philadelphia. Drawings and specifications (2603) can be obtained on application to the above bureau or to the commandant of the navy yard named.

PHILADELPHIA, PA.—Extensive improvements are contemplated by the American International Corporation at its local shipyards, including the installation of air compressors and pumps, to cost about $218,000. The company also is planning to double the capacity of the power house at its Bristol plant. The present building is about 75 ft. by 150 ft. New equipment will be installed in the power house at a cost of about $1,000,000.

PHILADELPHIA, PA.—The Fort Mifflin Shipbuilding Company of Philadelphia, recently incorporated with a capital stock of $10,000,000, is preparing plans for the construction of a shipbuilding plant on the Delaware River, near League Island. The plans provide for the construction of shipways for 16 vessels, machine shops, brass and iron foundry, boiler works, blacksmith shop, wood-working plant, etc.; also an industrial railway and a series of traveling cranes. Arthur Masters is president and Leonard E. Harris is consulting engineer.

PITTSBURGH, PA.—Contract has been awarded by the City Council to the Wilson Construction Company, Fulton Building, Pittsburgh, for the construction of an addition to the power house at the Mayview works, to cost about $29,993.

POTTSTOWN, PA.—The Industrial Foundry & Machine Company is reported to be considering the construction of a new power plant.

READING, PA.—The Metropolitan Edison Electric Company has begun work on the installation of a new underground conduit system in Penn Square and other streets in the city to replace overhead-wire system.

READING, PA.—T. A. Wilson & Company, Second and Washington Streets, have awarded a contract to the Beard Construction Company of Reading for the erection of a brick power house, 25 ft. by 45 ft., at its plant.

READING, PA.—The Reading Brewing Company has awarded the Metropolitan Edison Electric Company a contract for furnishing electricity at its works. The brewing company is planning to equip its plant for electrical operation, at a cost of about $10,000.

SHAMOKIN, PA.—The City Council has adopted plans for a street-lighting system in connection with the signing of the new contract in December.

SHARON, PA.—The contract for wiring the new houses under construction in the Shenango Land Company's plot, east of Sharon, for the American Sheet & Tin Plate Company, has been awarded to the Shenango Valley Electric Company.

CUMBERLAND, MD.—Plans, it is reported, have been approved by the Kelly-Springfield Tire Company of Akron, Ohio, for the construction of a new plant at Cumberland, to cost about $5,000,000. The proposed project will consist of a one-story machine shop, 100 ft. by 150 ft.; the main building about 700 ft. by 900 ft.; electric power station, 150 ft. by 150 ft., and other buildings. The cost of the equipment and machinery is estimated at about $1,000,000, for which some contracts have been awarded. S. Diescher & Sons, Farmers' Bank Building, Pittsburgh, Pa., are consulting engineers.

CHARLESTOWN, W. VA.—The West Virginia Water & Electric Company has been granted a permit to erect a power house on Slack Street, to cost about $10,000. Contract has been awarded to James L. Montgomery for construction of building.

KINGWOOD, W. VA.—The Preston County Power Company is contemplating extensions to its system.

TRIADELPHIA, W. VA.—Plans are being considered by the Town Council for the installation of an electric-lighting system in Triadelphia.

WELCH, W. VA.—The Solvay Collieries Company is contemplating the installation of new power equipment at its Exeter Colliery.

WHEELING, W. VA.—The City Council is considering three propositions concerning the Wheeling Electric Company's franchise, any one of which the city may accept for a period of ten years: First, that the Wheeling Electric Company pay $500 per year for the franchise and light the city building; second, that the company pay to the city 2 per cent of its gross commercial business; third, that the company furnish the city with 550 street lamps at $30 each per year. The ordinance was granted ten years ago. At present the city is using the first provision. It is exnected that the present investigations will result in the Wheeling Electric Company taking over the lighting of the city. The installation of a new street-lighting system is also under consideration.

CAPE CHARLES, VA.—Plans have been prepared for the construction of a power house, 40 ft. by 53 ft., for Hickle Kellogg, to cost about $10,000.

NORFOLK, VA.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until Oct. 29, for furnishing and installing two electrically-driven capstans at the navy yard, Norfolk. Drawings and specifications (2591) may be obtained on application to the above bureau or to the commandant of the navy yard named.

NORFOLK, VA.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until Oct. 29 for remodeling Quarters H, Marine Barracks, Norfolk, Va., including electrical work, heating, plumbing, etc. Drawings and specifications (No. 2617) may be obtained on application to the above bureau or to the commandant of the navy yard, Norfolk, Va.

WEST POINT, VA.—Work has begun on the construction of a new plant for the York River Shipbuilding Corporation, Mutual Building, Richmond, on the Mattapani River, near West Point, to cost about $250,000. The plans provide for the erection of ten buildings and an electric power plant.

WINCHESTER, VA.—The Board of County Supervisors has granted the Northern Virginia Power Company permission to erect electric transmission lines from Winchester to Boyce, along the Winchester and Berry's Ferry turnpike.

WASHINGTON, D. C.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until Nov. 19 for furnishing three fitting-out cranes of 350 gross tons capacity at the navy yards, Norfolk, Va., New York, N. Y., and Philadelphia, Pa. Drawings and specifications (No. 2587) may be obtained on application to the bureau or to the commandants of the navy yards named.

WASHINGTON, D. C.—President Wilson has approved the location at Sheffield, Ala., of the initial ammonia and nitric-acid plant to be constructed by the government with part of the $20,000,000 recently made available by Congress for the creation of a new source of supply of nitrates in making powder for the government. Sheffield is located on the Tennessee River, just below the Muscle Shoals, and is near the phosphate beds of central Tennessee.

WASHINGTON, D. C.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Nov. 8 for furnishing and installing lighting fixtures in the United States post offices at Berlin, N. H.; Burlington, Wis.; Cameron, Tex.; Charlton, Iowa; Fort Morgan, Col.; Frederick, Md.; Hammond, La.; Hiawatha, Kan.; Madison, S. D.; Maquoketa, Iowa; Marion, Ky.; Martins Ferry, Ohio; Martin, Tenn.; Media, Pa.; Mena, Ark.; Pulaski, Va.; Reading, Mass.; Richfield, Utah; Savanna, Ill.; Statesboro, Ga.; Wahoo, Neb., and Wenatchee, Wash.; the United States post office and court house extension at East St. Louis, Ill., and the post office and court house extension at Huntington, W. Va. Drawings and specifications may be obtained at the above office.

WASHINGTON, D. C.—Bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., for furnishing at the various navy yards and naval stations supplies as follows: Norfolk and Charleston, Schedule 1525—miscellaneous single, portable, switchboard type, direct-current ammeters, 950 steel reflectors, miscellaneous nickel chromium resistance ribbon, miscellaneous cambric insulating tape; Schedule 1524—25,000 solid covered arc-lamp carbons, 9500 unglazed porcelain tubes. Norfolk, Va., Schedule 1525—miscellaneous back and front connected switch contact blocks and clips, miscellaneous cartridge type, fuse blocks, 1900 yd. pigtail copper ribbon, 400 lb. spring copper ribbon, 1300 rolls varnished silk tape. Philadelphia, Pa., Schedule 1525—miscellaneous hard and soft plate carbon, 132 electric flatirons, 6 lb. to 8 lb. Boston, Mass., and Philadelphia, Pa., Schedule 1525—miscellaneous contact ferrule fuse clips, miscellaneous grade B pressed mica tubing. Various, Schedule 1525—245 double-pole combination plug and switch cut-outs, miscellaneous plug type inclosed fuses, miscellaneous 4-amp. glass tube fuses, link fuses, 21,000 non-water-tight portable guards, 5600 shade holders, miscellaneous electric soldering irons, 126 white masthead lanterns, miscellaneous red, green running lanterns, miscellaneous grades A and B pressed plate mica, miscellaneous soldering paste, miscellaneous Edison base attachment plugs, hard rod rubber, cotton asbestos sleeving, miscellaneous wall incandescent lamp sockets, miscellaneous copper-covered, saddle insulated staples, miscellaneous back-connected knife switches, indicating snap switches, plain muslin insulating tape, miscellaneous copper cable terminals, miscellaneous hard-rubber tubing. Norfolk, Va., and Mare Island, Cal., Schedule 1524—20,900 solid and split porcelain knobs. Charleston, S. C., Schedule 1525—Six type C white signal lanterns. Boston and Norfolk, Schedule 1525—2050 lb. flexible plate mica, 7500 yd. oiled-insulating muslin, 750-lb. insulating fish paper. Portsmouth and Charleston, Schedule 1525—250 5-amp. hooded receptacles. Boston, Mass., Schedule 1525—5000 illuminating set socket rings. Brooklyn, N. Y., Schedule 1525—25,400 lamp sockets, 64,000 two-hole connection boxes for ten-wire terminals; 830 lead-acid type storage battery testing outfits. Mare Island, Schedule 1525—210 ft. grade B pressed mica tubing. Application for proposal blanks should give the schedule desired by number.

North Central States

HIGHLAND PARK, MICH.—The Council has decided to ask for bids for 66 ornamental iron lamp standards to be erected around the new reservoir.

WAYLAND, MICH.—Owing to the high price of coal the C. H. Brush Light & Power Company has closed down its plant, leaving the town without electrical service. Plans are being considered to ask the Consumers' Power Company to extend its transmission line to Wayland to light the town.

CINCINNATI, OHIO.—A new power plant is included among the improvements contemplated by the Sayers & Scoville Company. New machinery is now being installed in the new addition to its works.

CLEVELAND, OHIO.—Bids will be received at the office of the commissioner of purchases and supplies, City Hall, Cleveland, until Oct. 26 for one motor-driven, power-house type coal crusher for the division of water. Specifications may be obtained at the office of the commissioner.

PORT CLINTON, OHIO.—The Northwestern Ohio Railway & Power Company, Ohio Building, Toledo, is considering the installation of a 5000-kw. turbo-generator at its local power plant.

BENHAM, KY.—The United States Coal & Coke Company is reported to be considering the installation of an electric-lighting plant.

HELLIER, KY.—The Greenough Coal Company of Uniontown, Pa., is considering the construction of a new power plant, 45 ft. by 70 ft., at its local works.

MURRAY, KY.—Bonds to the amount of $20,000 have been voted for the installation of an electric-light plant and water-works system.

NORTH MANCHESTER, IND.—The capital stock of the Eel River Telephone Company has been increased from $40,000 to $80,000.

HARLEM, ILL.—Plans are being considered by Brown Brothers for the installation of an electric-light plant. Equipment, it is understood, has been purchased.

JOLIET, ILL.—The City Council is considering the installation of a new street-lighting system. It is proposed to install 250-cp. nitrogen-filled lamps, equipped with refractors. It is estimated that the proposed new lighting system would save the city $8,100 per year.

WILMETTE, ILL.—The Village Council has offered to grant the request of the Public Service Company of Northern Illinois to build a substation at the terminal of the Northwestern Elevated Railroad at Linden Avenue, under the condition that the company agrees to erect the building according to specifications furnished by the village. The proposed station is to furnish energy to operate the elevated railroad.

KIEL, WIS.—The Kiel Woodenware Company is contemplating an addition, 80 ft. by 320 ft., to its plant, and also an extension to its steam generating plant, involving an expenditure of from $65,000 to $75,000. Plans are being prepared by the Thomas S. Watson Company, Majestic Building, Milwaukee, consulting engineer.

MILWAUKEE, WIS.—Plans are being prepared by the Pawling & Harnischfeger Company of Milwaukee for the erection of another extension to its machine shop, 50 ft. by 160 ft. A 500-kw. addition to power plant is nearly completed. The company manufactures electric traveling cranes. O. A. Ruemelin is vice-president and general superintendent.

STEVENS POINT, WIS.—The Jackson Milling Company, it is reported, is planning to build a dam across the Wisconsin River, to cost about $500,000. It is expected to have the dam, power house and transmission lines completed by September, 1918.

WAUPUN, WIS.—The Rock River Valley Hemp Mills of Waupun is planning to build an addition to its power house, 30 ft. by 30 ft., in which a 150-hp. engine will be installed.

LAKEFIELD, MINN.—Bids will be received by H. J. Hayden, clerk of board of education, independent district No. 3, Lakefield, until Nov. 2 for the construction of a general high school building and a manual training building; also bids for heating, ventilation, electric wiring, electric fixtures and furniture. Plans are on file at the Builders' Exchanges at Minneapolis, St. Paul and Mankato. Copies of plans and specifications may be obtained at the office of Kirby T. Snyder, architect, Plymouth Building, Minneapolis, upon deposit of $15.

OWATONNA, MINN.—Bids will be received by John Dinsmore, secretary of the independent school district No. 1, Owatonna, until Nov. 6 for construction of high school building as follows: (a) General contract; (b) plumbing; (c) electrical construction; (d) heating and ventilation; (e) sheet-metal (ventilation); (f) temperature regulation; (g) fans, motor drives and heaters; (h) air washers and humidity control equipment; (i) vacuum heating equipment. Plans and specifications may be obtained at the office of Nels S. Jacobson, architect, Owatonna, upon deposit of $25 for (a) general contract, of which $18 will be refunded upon return of plans; $15 deposit will be required for each set of plans for contracts (b), (c) and (d), the latter including the work required in contracts (e), (f), (g), (h) and (i), of which $11.50 will be refunded upon return of plans.

DAVENPORT, IOWA.—Bids will be received by the board of education of the independent school district of Davenport, 1130 Main Street, Davenport, until Oct. 31 for the construction of three intermediate school buildings in Davenport. Separate bids will be received for one or more of the three buildings as follows: General contract, electric wiring, plumbing, and for the combined heating and ventilating apparatus. Drawings and specifications may be seen at the office of Temple & Burrows, Savings Bank Building, Davenport.

DES MOINES, IOWA.—The Board of State Railroad Commissioners has granted the Des Moines Electric Company a franchise to erect and operate electric transmission lines in Polk County.

MOORHEAD, IOWA.—Work is progressing rapidly on the construction of the new electric-lighting plant in Moorhead.

BETHANY, MO.—Bonds to the amount of $4,500 have been voted for the installation of an oil engine in the municipal electric-light plant.

FREDERICKTON, MO.—The Missouri Public Utilities Company of Cape Girardeau, it is reported, has offered to purchase the municipal electric-light plant at $16,000. An election will soon be called to submit the proposal to the voters.

HARRISONVILLE, MO.—L. K. Green & Sons, owners of the local electric-light plant, it is reported, are building a central power plant at Pleasant Hill.

HIGGINSVILLE, MO.—Plans are being considered for the installation of an ornamental lighting system on Russell Street.

KANSAS CITY, MO.—Contract has been awarded by the Kansas City Light & Power Company to the Foundation Company, 233 Broadway, New York, N. Y., for construction of foundations for its proposed new electric generating station, to cost complete from $3,000,000 to $4,000,000. The company has placed orders with the General Electric Company of Schenectady, N. Y., for two 20,000-kw. turbo-generators. Plans and specifications were prepared by Sargent & Lundy, consulting engineers of Chicago, Ill.

MOUND CITY, MO.—The Mound City Electric Light & Ice Company, it is reported, has been granted a franchise to supply water in Mound City. The City Council has decided to abandon the municipal water system.

NETTLETON, MO.—Arrangements have been made with the Hamilton (Mo.) Light & Power Company to furnish electrical service in Nettleton. The company already has a transmission line through Nettleton to Breckenridge.

VERSAILLES, MO.—The municipal electric-light plant was recently destroyed by fire.

FAIRBURY, NEB.—The Council has decided to extend the municipal electric-lighting service to the limits of the city at the west end of Second Street and to furnish electricity to light the new bridge.

LINCOLN, NEB.—The Platte Valley Telephone Company is contemplating an issue of $50,000 in bonds, the proceeds to be used for extensions and improvements.

YORK, NEB.—The Public Service Company has applied to the State Railway Commission for a franchise to erect an electric transmission line from Stromsberg to Osceolo.

BELOIT, KAN.—We are informed that the city of Beloit is not considering the proposal submitted by the Concordia (Kan.) Electric Company to furnish electricity here, as reported in the issue of Sept. 29. The company submitted a proposition to the City Council, but it was rejected without investigation, as the city is operating a municipal plant at a profit. The city favors municipal ownership of all public utilities and is now building a new power plant, setting a new boiler, providing a new foundation for the installation of a new 300-kva. turbine, erecting a new radial brick chimney, installing a new steam heater, filtration plant and pumping station. All transmission lines have been placed underground in the business district and conduits have been laid in 34 blocks for ornamental lamps in the streets that have been paved this year. F. A. Darst is superintendent of the water and light department.

BENNINGTON, KAN. — The Markley Company has been granted a 20-year franchise for furnishing electricity in Bennington and also a contract for street lighting for a period of 20 years.

CANEY, KAN.—Steps, it is reported, have been taken to establish a municipal electric-lighting plant in Caney.

COLUMBUS, KAN.—Improvements to its local system, to cost about $10,000, are under consideration by the Home Telephone Company.

CUBA, KAN.—The Council is considering a proposal submitted by the Concordia Electric Light Company to furnish electricity in Cuba.

HAVEN, KAN.—The electric-light plant of the Haven Electric Light & Ice Company has been closed down.

HUNTER, KAN.—The installation of an electric-lighting system in Hunter is under consideration.

HUTCHINSON, KAN.—A petition has been presented to the City Council by residents of the extreme eastern section of the city for an extension of the electric-lighting system to that part of the city.

TOPEKA, KAN.—All bids submitted for the extension of the ornamental lighting system from Tenth to Eleventh streets on Kansas Avenue have been rejected as being too high, the lowest being $4,100.

Southern States

WARRENTON, N. C.—Plans are being prepared by Gilbert White of Durham, N. C., for a municipal electric-light plant (about 300 kw.) for Warrenton. A. G. Elliott is city manager.

CORNELIA, GA.—The Wofford Shoals Light & Power Company is contemplating the erection of an electric transmission line, 5½ miles long, to connect the Clarkville system with the local system. Later the company will probably extend its lines to Lula. Additional (future) water power development is under consideration.

TAMPA, FLA.—The Tampa Electric Company is planning an extension to its Hyde Park-Michigan line.

MEMPHIS, TENN.—The Tri-State Baptist Board has awarded the contract for the erection of an eight-story annex to its hospital, 78 ft. by 150 ft., to the James Alexander Construction Company of Memphis, at $200,000. The cost of the lighting fixtures, etc., is estimated at $8,000 and elevator at $4,000.

MONTGOMERY, ALA.—The Montgomery Light & Traction Company is contemplating an extension of its street railway service to Camp Sheridan.

TUSCALOOSA, ALA.—The Tuscaloosa Railway & Utilities Company is considering an extension to its power station and car house.

WAYNESBORO, MISS.—The City Council is considering an issue of $6,000 in bonds for the construction of an electric-light plant.

DRUMRIGHT, OKLA.—Steps have been taken by local business men for the installation of an ornamental lighting system to extend along the entire street district which is to be paved. The cost is estimated at $10,000.

EUFAULA, OKLA.—Plans prepared by J. L. Lowe for construction of power plant at the river have been accepted by the City Council. It is proposed to erect a building for boiler, pumping station, etc. Bids, it is understood, will soon be asked for.

MEDICINE PARK, OKLA.—Plans are being considered by J. Elmer Thomas, of Lawton, State Senator and owner of Medicine Park, for extensive improvements here, which will include an electric-lighting plant.

OKMULGEE, OKLA.—The Pioneer Telephone & Telegraph Company has awarded the general contract for construction of a telephone exchange in Okmulgee to Reinhart & Donovan of Oklahoma City. The cost of the building is estimated at about $47,000. G. R. Potter is local manager.

TISHOMINGO, OKLA.—The question of establishing a municipal electric-light plant is under consideration.

VINITA, OKLA.—The construction of a hydroelectric power plant, to cost about $2,000,000, is under consideration by the Southwestern Power Company to supply electricity in Vinita and neighboring towns and cities. The plans provide for the erection of three dams across Grand River, similar to those at Lowell, Kan. Charles H. Collins, First National Bank, Vinita, is reported interested.

DALLAS, TEX.—Plans are being made by the Dallas Railway Company for the construction of five car lines and extensions, for which iron and other material have been ordered. Approval of the Board of Commissioners must be obtained before work on the proposed extensions can begin.

Pacific and Mountain States

INDEX, WASH.—Contracts have been awarded by the Town Council for equipment for the municipal electric-light plant. G. N. Miller & Son of Seattle have charge of construction work.

SEATTLE, WASH.—The War Department has awarded a contract to the Aero Alarm Company of Seattle for the installation of aero automatic fire-alarm systems in 330 buildings in 16 National Army cantonments and a similar number of National Guard cantonments in various parts of the United States. The first buildings to be equipped will be the warehouses where foodstuffs are stored. The company has also been instructed to make the necessary alterations in the Aero Alarm installations in the steamships Great Northern and Northern Pacific, recently taken over by the federal government.

WASHOUGAL, WASH.—The Northwestern Electric Company has applied to the County Commissioners for an extension of its franchise privilege to supply electricity in the eastern part of the county near Camas and Washougal.

HOULTON, ORE. — The Milton Creek Logging Company is installing an electric power plant to furnish electricity for lighting its offices, camps and employees' dwellings. The contract for initial wiring covers 42 buildings.

MAPLETON, ORE.—The local electric-lighting system is reported to have been purchased by the North Star Power Company.

BURBANK, CAL.—Electric furnaces will be installed in the new foundry building, 60 ft. by 120 ft., being erected at the new plant of the Moreland Truck Company, 1701 North Main Street, Los Angeles.

EUREKA, CAL.—Work will begin at once by the Western Gas & Electric Company of Eureka on laying the cable for the transmission of electricity to the Rolph shipyards and later to the Fay plant.

MOJAVE, CAL.—An election has been called to submit the proposal to form a lighting district in Mojave to the voters.

SAN DIEGO, CAL.—The Board of County Supervisors has granted the San Diego Consolidated Gas & Electric Company a 50-year franchise to extend its electric transmission lines throughout the county.

SAN FRANCISCO, CAL.—The Board of Supervisors has granted the Municipal Railways a franchise to construct a new street car line from the west portal of the Twin Peaks Tunnel to Twentieth and Taraval Streets. The Supervisors have also set aside $90,000 of the municipal railroad fund to be used in the construction of the proposed extension.

TAHOE, CAL.—Plans are being considered by Lora J. Moore of Tahoe for the development of a hydroelectric plant on Slim Jim Creek in Placer County, to cost about $10,000.

MONTICELLO, UTAH.—The Blue Mountain Irrigation Company is contemplating an issue of $60,000 in bonds, it is reported, the proceeds to be used for improvements to its light and water plant.

SALT LAKE CITY, UTAH.—Equipping the Denver & Rio Grande Railroad between Salt Lake City and Helpner for electrical operation, it is reported, will be undertaken soon after the merging of the railroad with the Missouri Pacific and the Western Pacific railroads.

DOUGLAS, ARIZ.—The Douglas Traction & Light Company is contemplating building an extension to Pirtle in the near future.

SNOWFLAKE, ARIZ.—Steps have been taken to organize a company to install an electric-light and power plant to supply electricity in Snowflake and Taylor. The company will be capitalized at $50,000. The stockholders of the Snowflake & Taylor Irrigation Company are interested in the project.

TAPCO, ARIZ.—The new electric plant of the Arizona Power Company in Tapco has been started, assuring an adequate supply of power for mining interests around Jerome.

Canada

KASLO, B. C.—The ratepayers have recently voted to appropriate $1,500 for improvements to the municipal electric-light plant and the same amount for water-works extensions.

CHAPLEAU, ONT.—The installation of an electrically operated pumping unit in the municipal pumping station, to cost about $6,000, is under consideration.

CORNWALL, ONT.—Application has been made to the Minister of Public Works at Ottawa by the Power Development Company, recently incorporated with a capital stock of $500,000, for permission to build a dam in the St. Lawrence River, near Cornwall.

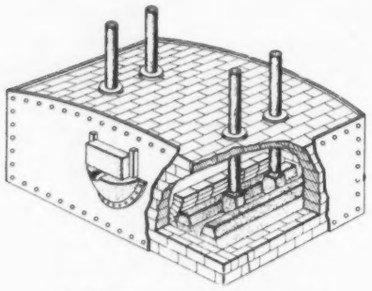
PERTH, ONT.—New equipment, consisting of boilers, engine, generators, etc., will be required for the soap factory which is being built for Henry K. Wampole & Company, Herriott Street, Perth. The cost of the plant is estimated at about $50,000.

PETERBORO, ONT.—The construction of an addition to its plant at Peterboro, to cost about $40,000, is contemplated by the Canadian General Electric Company of Toronto. E G. Paterson is superintendent of the Peterboro plant.

PORT COLBORNE, ONT.—The municipalities of Port Colborne and Humberstone are considering the question of entering into a contract with the Hydro-Electric Power Commission of Ontario for energy. The Ontario Power Company owns and operates the distribution systems in both of these municipalities.

1,242,132. ELECTRIC CLOCK; Gustav Blumberg and John A. Butkus, Baltimore, Md. App. filed Oct. 13, 1915. Entirely devoid of springs in the time train.

1,242,171. ELECTRIC WELDING; Henry Geisenhoner, Schenectady, N. Y. App. filed March 16, 1915. Effects of scale, dirt, etc., between the work and an electrode in opposing the welding are overcome.



1,242,275—Electric Furnace

1,242,209. ELECTRIC HEATER; Wilbur A. La Motte, Elizabeth, N. J. App. filed Nov. 14, 1916. Fluid may be heated to any desired temperature in a simple and efficient manner.

1,242,250. ELECTRIC FURNACE CONTROL; John A. Seede, Schenectady, N. Y. App. filed May 8, 1916. Arc type.

1,242,255. FARM GATE; Silas R. Skaggs, Richland Springs, Tex. App. filed Sept. 25, 1916. For either opening or closing the gate upon the pulling of an operating cable.

1,242,260. LIMIT SWITCH FOR HOISTING MACHINE; Fred L. Stone, Schenectady, N. Y. App. filed July 24, 1915. Designed for use in connection with a system of mine hoisting mechanism in which the cage must be slowed down before it arrives at the landing.

1,242,267. SAFETY DEVICE FOR STARTING MECHANISMS; Brice P. Swyers, Pittsburgh, Pa. App. filed June 14, 1913. Automobiles.

1,242,275. ELECTRIC FURNACE; Irving R. Valentine, Schenectady, N. Y. App. filed May 12, 1917. Improvements.

1,242,284. LOAD-REGULATING SYSTEM; William L. Waters, Milwaukee, Wis. App. filed July 22, 1914. Improvements.

1,242,326. FUSE BLOCK; Henry H. Curtis, Springfield, Mass. App. filed Sept. 23, 1914. For use in double-branch wiring.

1,242,333. AUTOMATIC LINE CLOSER FOR SERIES ELECTRICAL CIRCUITS; Bert S. Eddy, Elmira, N. Y. App. filed March 26, 1917. Primary object of the invention is the provision of an auxiliary normally open circuit for any series lines, the same being automatically closed upon an interruption in the main circuit, provision being made for restoring the device in its open position when the main line is restored.

1,242,337. ELECTRICAL DISTILLING APPARATUS; Charles H. Fulton, St. Louis, Mo. App. filed Dec. 7, 1916. Improvement.

1,242,341. ELECTRIC FURNACE; Charles H. Fulton, St. Louis, Mo. App. filed Feb. 23, 1917. Electrically connecting the cooperating columns of briquettes together in such a manner that there is no liability of the circuit being interrupted in case one column of a pair shrinks or becomes slightly deformed, owing to arcing or any other cause.

1,242,349. AUTOMATIC ALARM; Herbert E. House, Los Angeles, Cal. App. filed Nov. 30, 1914. Improved electric bell-circuit-closing mechanism of the spring-controlled type.

1,242,371. SHUTTLE LOCK; Frank M. Pierce, Chicago, Ill. App. filed Jan. 2, 1915. For tire-wrapping machines.

1,242,442. MAKING PIG IRON; Ernest Humbert, Welland, Ontario, Can. App. filed May 17, 1917. Furnace is charged with the scrap and a quantity of coke or coal or other carbonaceous material proportioned to the carbon content of the scrap and that desired in the pig iron to be produced.

1,242,457. ELECTRIC CIRCUIT; Matthew H. Loughridge, Bogota, N. J. App. filed July 17, 1916. Particularly for a compound arrangement of circuits in which characteristics may be introduced into the conductors of said circuit at various points to vary the operation of an electric translating device in said circuit.

Record of Electrical Patents

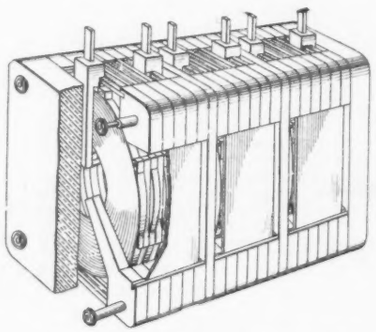
Notes on United States Patents issued on October 9, 1917

1,242,464. ELECTRIC METALLURGICAL FURNACE AND METHOD OF OPERATING THE SAME; William E. Moore, Pittsburgh, Pa. App. filed Nov. 27, 1916. Employs a relatively long arc and high voltage, and in refining acts to reduce the length of this arc (to zero if desired) and to reduce the voltage without materially altering the current.

1,242,472. DEVICE FOR MEASURING ELECTRICAL ENERGY; John S. Piper, Yonkers, N. Y. App. filed June 12, 1914. Consists in connecting two watt-hour meters of the electrometer or other type in series with each other and with the load in such manner that when one meter is running in the proper direction to measure the electrical energy or power consumed by the load the other meter will tend to run backward.

1,242,483. WORK AND TIME INDICATOR; William H. Shuster, Jr., and Allen L. Grammer, Philadelphia, Pa. App. filed Nov. 18, 1916. New.

1,242,497. POLYPHASE REACTANCE COIL; Philip Torchio and Harry R. Woodrow, New York, N. Y. App. filed March 15,



1,242,497—Polyphase Reactance Coil

1917. Consists, first, in a construction employing a plurality of sets of coils of the "pancake" type, the coils of each set being connected in multiple and respectively connected to currents of different phase, and, second, in the construction of the casing wherein said sets of coils are supported and inclosed.

1,242,498. X-RAY APPARATUS; Julius B. Wantz, Chicago, Ill. App. filed Nov. 5, 1914. Improvements in table whereby a table of compact form adapted to be operated in various ways for either stereoscopic or picture work may be provided.

1,242,499. THERMO-ELECTRIC GENERATOR; Hartwell W. Webb, Cresskill, N. J. App. filed March 17, 1913. Particularly adapted for utilizing the waste heat of the exhaust gases of internal-combustion engines.

1,242,533. LOOM FASTENER; John J. Duck, Toledo, Ohio. App. filed March 23, 1917. Particularly intended for holding one or more non-metallic flexible looms in place at outlet boxes.

1,242,549. APPARATUS FOR CHANGING DIRECT ELECTRIC CURRENTS INTO INTERRUPTED ALTERNATING CURRENTS; Anatole C. Heiny, New York, N. Y. App. filed March 2, 1917. Improvements.

1,242,552. AUTOMATIC FIRE ALARM; Milton F. Humphries, Morrin, Alberta, Can. App. filed June 30, 1915. Regulated to operate at predetermined temperatures.

1,242,554. ELECTRODE HOLDER; Raymond O. Jackson, St. Louis, Mo. App. filed Feb. 23, 1917. Improvement.

1,242,575. SIGNAL MECHANISM; Silvestro Milano, New York, N. Y. App. filed Feb. 11, 1915. Adapted to be operated automatically by the presence of gas in a room or apartment, or by smoke or fire therein, so as to awaken persons sleeping in said apartment, whereby asphyxiation of the sleeper or loss of life by fire is prevented.

1,242,581. METHOD OF AND APPARATUS FOR ELECTRICALLY MAKING OPENINGS IN METAL PLATES; Thomas E. Murray, Jr., Brooklyn, N. Y. App. filed July 13, 1917. Improvement.

1,242,616. SECTIONAL HIGH-POTENTIAL INSULATOR; Sol. S. Sonneborn, Brooklyn, N. Y. App. filed Dec. 9, 1916. Employed as bushings for insulating transformer leads and the like from what is usually a grounded, perforated barrier of conducting material through which the conducting lead must emerge and from which it must be insulated.

1,242,625. SYSTEM OF SIGNALING FOR MINE HOISTS; Max A. Whiting, Schenectady, N. Y. App. filed July 21, 1916. To prevent the overwinding of the cages when men are being lifted.

1,242,632. SYSTEM OF ELECTRICAL DISTRIBUTION; Ernst F. W. Alexanderson, Schenectady, N. Y. App. filed June 22, 1915. Relates to systems of radio communication, and still more specifically to continuous-wave systems in which a high-frequency alternator is employed as the source of alternating-current energy of radio frequency.

1,242,637. ELECTRICAL CONNECTOR; Charles C. Armstrong, Marysville, Ohio. App. filed July 24, 1916. For use in connecting flexible conductors with portable heating devices, such as heaters for table use, sadirons and the like.

1,242,649. TRANSFORMER WINDING; Frederick F. Brand, Pittsfield, Mass. App. filed Sept. 28, 1916. Provides intermediate taps for windings without too appreciably increasing the exchange current between the conductors, as, for example, without effectively nullifying the transposition of the conductors.

1,242,656. ELECTRIC BATTERY; William R. Clymer, Lakewood, Ohio. App. filed April 17, 1916. Consists of two or more superposed cylindrical dry cells with the top of the lower cell electrically connected to the bottom of the cell immediately above.

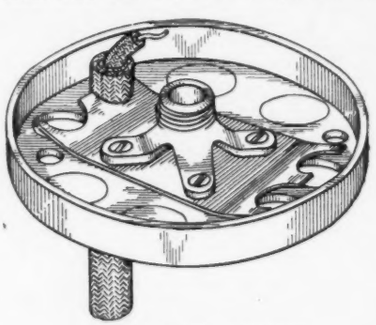
1,242,687. ELECTRIC HEATER; August Harth, Chatham, N. J. App. filed Aug. 29, 1916. Portable.

1,242,695. METHOD OF AND APPARATUS FOR ELECTROPLATING WIRE CLOTH; Ralph O. Hood, Danvers, Mass. App. filed March 1, 1916. Article is caused to travel horizontally above the normal level of a body of electrolyte between, or in the presence of, anodes of suitable construction, and the electrolyte by suitable means is raised so as to flood the article and make proper contact with the anode or anodes.

1,242,763. ELECTROMAGNET; Pierre Bossu, Paris, France. App. filed Dec. 19, 1913. Improvements.

1,242,816. SIGNALING APPARATUS; Petrus van Santen Kolff, Philadelphia, Pa. App. filed Nov. 16, 1916. Applicable where the speed of one shaft or the average speed of a plurality of shafts is to be indicated, through electrical mechanism, upon one or more indicating instruments.

1,242,833. SMELTING PROCESS AND APPARATUS; Ezra A. Mathers, New York, N. Y. App. filed Dec. 20, 1911. Improvements.



1,242,533—Loom Fastener

1,242,861. SIGN FLASHER; Conrad D. Pruitt, Berkeley, Cal. App. filed Oct. 6, 1914. Improves and simplifies the means for completing the various combinations of circuits which go to form the letters in the sign and is especially designed to provide means for simply and easily effecting changes in the combination of these circuits whereby the message flashed by the sign is readily changed.